DARWIN AND DAWKINS • PERU'S ANCIENT MYSTERIES • ROBIN HOOD

Skeptical Inquirer™

THE MAGAZINE FOR SCIENCE AND REASON

Volume 31, No. 4 • July/August 2007 • INTRODUCTORY PRICE U.S. $4.95 • Canada $5.95

THE SCIENCE BEHIND FICTION

SUPERHEROES, VAMPIRES, AND ZOMBIES

Global Climate Change *Part 2*

The Fingerprint Controversy

Earth and Stars in the Lunar Sky

REVIEWS

- The Stem Cell Controversy
- Islamic Science & Religion
- Alliance of Religion & Medicine
- Power of Critical Thinking

Published by the Committee for Skeptical Inquiry

COMMITTEE FOR SKEPTICAL INQUIRY

FORMERLY THE COMMITTEE FOR THE SCIENTIFIC INVESTIGATION OF CLAIMS OF THE PARANORMAL (CSICOP)
AT THE CENTER FOR INQUIRY/TRANSNATIONAL (ADJACENT TO THE STATE UNIVERSITY OF NEW YORK AT BUFFALO)

AN INTERNATIONAL ORGANIZATION

Paul Kurtz, Chairman; professor emeritus of philosophy, State University of New York at Buffalo
Barry Karr, Executive Director
Joe Nickell, Senior Research Fellow
Richard Wiseman, Research Fellow
Massimo Polidoro, Research Fellow
Lee Nisbet, Special Projects Director

FELLOWS

James E. Alcock,* psychologist, York Univ., Toronto
Jerry Andrus, magician and inventor, Albany, Oregon
Marcia Angell, M.D., former editor-in-chief, *New England Journal of Medicine*
Stephen Barrett, M.D., psychiatrist, author, consumer advocate, Allentown, Pa.
Willem Betz, professor of medicine, Univ. of Brussels
Barry Beyerstein,* biopsychologist, Simon Fraser Univ., Vancouver, B.C., Canada
Irving Biederman, psychologist, Univ. of Southern California
Susan Blackmore, Visiting Lecturer, Univ. of the West of England, Bristol
Henri Broch, physicist, Univ. of Nice, France
Jan Harold Brunvand, folklorist, professor emeritus of English, Univ. of Utah
Mario Bunge, philosopher, McGill University
Sean B. Carroll, professor of molecular genetics, Univ. of Wisconsin–Madison
John R. Cole, anthropologist, editor, National Center for Science Education
Frederick Crews, literary and cultural critic, professor emeritus of English, Univ. of California, Berkeley
Richard Dawkins, zoologist, Oxford Univ.
Geoffrey Dean, technical editor, Perth, Australia
Cornelis de Jager, professor of astrophysics, Univ. of Utrecht, the Netherlands
Daniel C. Dennett, University Professor and Austin B. Fletcher Professor of Philosophy, Director of the Center for Cognitive Studies at Tufts Univ.
Ann Druyan, writer and producer, and CEO, Cosmos Studios, Ithaca, New York
Kenneth Feder, professor of anthropology, Central Connecticut State Univ.
Antony Flew, philosopher, Reading Univ., U.K.
Barbara Forrest, professor of philosophy, Southeastern Louisiana Univ.
Andrew Fraknoi, astronomer, Foothill College, Los Altos Hills, Calif.
Kendrick Frazier, science writer, editor, SKEPTICAL INQUIRER
Yves Galifret, executive secretary, l'Union Rationaliste
Martin Gardner, author, critic
Murray Gell-Mann, professor of physics, Santa Fe Institute; Nobel laureate
Thomas Gilovich, psychologist, Cornell Univ.
Henry Gordon, magician, columnist, Toronto
Saul Green, Ph.D., biochemist, president of ZOL Consultants, New York, NY
Susan Haack, Cooper Senior Scholar in Arts and Sciences, Professor of Philosophy and Professor of Law, University of Miami
C. E. M. Hansel, psychologist, Univ. of Wales
David J. Helfand, professor of astronomy, Columbia Univ.
Douglas R. Hofstadter, professor of human understanding and cognitive science, Indiana Univ.
Gerald Holton, Mallinckrodt Professor of Physics and professor of history of science, Harvard Univ.
Ray Hyman,* psychologist, Univ. of Oregon
Leon Jaroff, sciences editor emeritus, *Time*
Sergei Kapitza, former editor, Russian edition, *Scientific American*
Lawrence M. Krauss, author and professor of physics and astronomy, Case Western Reserve University
Harry Kroto, professor of chemistry and biochemistry, Florida State University; Nobel laureate
Edwin C. Krupp, astronomer, director, Griffith Observatory
Paul Kurtz,* chairman, Center for Inquiry
Lawrence Kusche, science writer
Leon Lederman, emeritus director, Fermilab; Nobel laureate in physics
Scott Lilienfeld, psychologist, Emory Univ.
Lin Zixin, former editor, *Science and Technology Daily* (China)
Jere Lipps, Museum of Paleontology, Univ. of California, Berkeley
Elizabeth Loftus, professor of psychology, Univ. of California, Irvine
Paul MacCready, scientist/engineer, AeroVironment, Inc., Monrovia, Calif.
John Maddox, editor emeritus of *Nature*
David Marks, psychologist, City University, London.
Mario Mendez-Acosta, journalist and science writer, Mexico City, Mexico
Marvin Minsky, professor of media arts and sciences, M.I.T.
David Morrison, space scientist, NASA Ames Research Center
Richard A. Muller, professor of physics, Univ. of Calif., Berkeley
Joe Nickell, senior research fellow, CSI
Lee Nisbet,* philosopher, Medaille College
Bill Nye, science educator and television host, Nye Labs
James E. Oberg, science writer
Irmgard Oepen, professor of medicine (retired), Marburg, Germany
Loren Pankratz, psychologist, Oregon Health Sciences Univ.
Robert L. Park, professor of physics, Univ. of Maryland
John Paulos, mathematician, Temple Univ.
Steven Pinker, cognitive scientist, Harvard
Massimo Polidoro, science writer, author, executive director CICAP, Italy
Milton Rosenberg, psychologist, Univ. of Chicago
Wallace Sampson, M.D., clinical professor of medicine, Stanford Univ., editor, *Scientific Review of Alternative Medicine*
Amardeo Sarma, manager NEC Europe Ltd., executive director, GWUP, Germany.
Evry Schatzman, former president, French Physics Association
Eugenie Scott, physical anthropologist, executive director, National Center for Science Education
Robert Sheaffer, science writer
Elie A. Shneour, biochemist, author, president and research director, Biosystems Research Institute, La Jolla, Calif.
Dick Smith, film producer, publisher, Terrey Hills, N.S.W., Australia
Robert Steiner, magician, author, El Cerrito, Calif.
Victor J. Stenger, emeritus professor of physics and astronomy, Univ. of Hawaii; adjunct professor of philosophy, Univ. of Colorado
Jill Cornell Tarter, astronomer, SETI Institute, Mountain View, Calif.
Carol Tavris, psychologist and author, Los Angeles, Calif.
David Thomas, physicist and mathematician, Peralta, New Mexico
Stephen Toulmin, professor of philosophy, Univ. of Southern California
Neil deGrasse Tyson, astrophysicist and director, Hayden Planetarium, New York City
Marilyn vos Savant, *Parade* magazine contributing editor
Steven Weinberg, professor of physics and astronomy, Univ. of Texas at Austin; Nobel Laureate
E.O. Wilson, University Professor Emeritus, Harvard University
Richard Wiseman, psychologist, University of Hertfordshire
Benjamin Wolozin*, professor, department of pharmacology, Boston University School of Medicine
Marvin Zelen, statistician, Harvard Univ.

* Member, CSI Executive Council
(Affiliations given for identification only.)

• • • Visit the CSI Web site at www.csicop.org • • •

The SKEPTICAL INQUIRER (ISSN 0194-6730) is published bimonthly by the Committee for Skeptical Inquiry, 3965 Rensch Road, Amherst, NY 14228. Printed in U.S.A. Periodicals postage paid at Buffalo, NY, and at additional mailing offices. Subscription prices: one year (six issues), $35; two years, $60; three years, $84; single issue, $4.95. Canadian and foreign orders: Payment in U.S. funds drawn on a U.S. bank must accompany orders; please add US$10 per year for shipping. Canadian and foreign customers are encouraged to use Visa or MasterCard. Canada Publications Mail Agreement No. 41153509. Return undeliverable Canadian addresses to: IMEX, P.O. Box 4332, Station Rd., Toronto, ON M5W 3J4.

Inquiries from the media and the public about the work of the Committee should be made to Paul Kurtz, Chairman, CSI, P.O. Box 703, Amherst, NY 14226-0703. Tel.: 716-636-1425. Fax: 716-636-1733.

Manuscripts, letters, books for review, and editorial inquiries should be addressed to Kendrick Frazier, Editor, SKEPTICAL INQUIRER, 944 Deer Drive NE, Albuquerque, NM 87122. Fax: 505-828-2080. Before submitting any manuscript, please consult our Guide for Authors for format and references requirements. It is on our Web site at www.csicop.org/si/guide-for-authors.html and on page 69 of the November/December 2006 issue. Or you may send a fax request to the editor.

Articles, reports, reviews, and letters published in the SKEPTICAL INQUIRER represent the views and work of individual authors. Their publication does not necessarily constitute an endorsement by CSI or its members unless so stated.

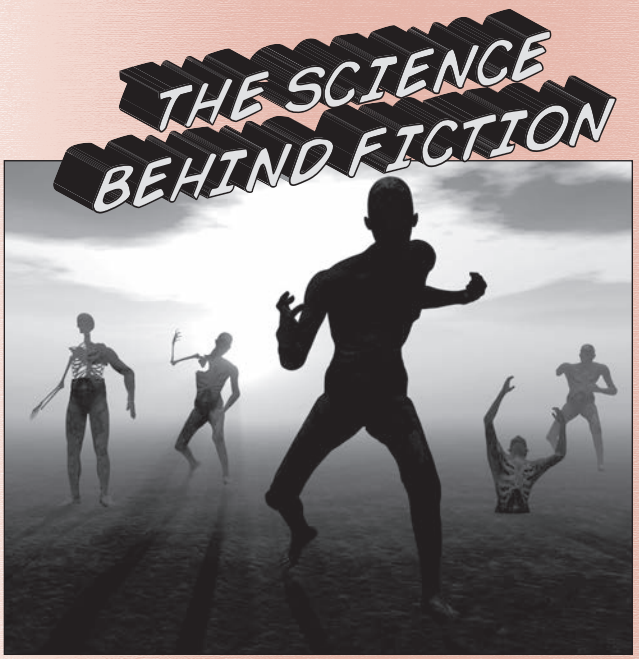
Copyright ©2007 by the Committee for Skeptical Inquiry. All rights reserved. The SKEPTICAL INQUIRER is available on 16mm microfilm, 35mm microfilm, and 105mm microfiche from University Microfilms International and is indexed in the Reader's Guide to Periodical Literature.

Subscriptions and changes of address should be addressed to: SKEPTICAL INQUIRER, P.O. Box 703, Amherst, NY 14226-0703. Or call toll-free 1-800-634-1610 (outside the U.S. call 716-636-1425). Old address as well as new are necessary for change of subscriber's address, with six weeks advance notice. SKEPTICAL INQUIRER subscribers may not speak on behalf of CSI or the SKEPTICAL INQUIRER.

Postmaster: Send changes of address to SKEPTICAL INQUIRER, P.O. Box 703, Amherst, NY 14226-0703.

Skeptical Inquirer

July / August 2007 • Vol. 31, No. 4



27 **Cinema Fiction vs. Physics Reality**
Ghosts, Vampires, and Zombies
COSTAS J. EFTHIMIOU AND SOHANG GANDHI

35 **Superhero Science**
BENJAMIN RADFORD

ARTICLES

37 **Global Climate Change Triggered by Global Warming**
Part 2
STUART D. JORDAN

41 **The Fingerprint Controversy**
SIMON A. COLE

47 **The Earth and Stars in the Lunar Sky**
WILLIAM C. KEEL

COMMENT & OPINION

11 **Onward Science Soldiers**
VICTOR J. STENGER

SPECIAL REPORT

13 **Little Audrey: The Life and Death of a 'Victim Soul'**
JOE NICKELL

COLUMNS

EDITOR'S NOTE
Hope for the Future, and Early Reaction on Global Warming 4

NEWS AND COMMENT
New Findings Show Some Improvements in U.S. Science Literacy / 'Court TV' Psychic Loses to Skeptic in Real Court / CSI Executive Council Members Meet in D.C., Speak on Restoring Scientific Integrity / Feng Shui and Monkey Madness at the L.A. Zoo / Philadelphia Psychics Shut Down, Then Allowed to Reopen / Stem Cells: President Bush Vows to Protect One-Celled People / Psychic Events Workshop Fails APA Curriculum Requirement 5

INVESTIGATIVE FILES
Peru's Ancient Mysteries
JOE NICKELL 15

THINKING ABOUT SCIENCE
Is Dawkins Deluded?
When Scientists Talk about Religion
MASSIMO PIGLIUCCI 20

NOTES ON A STRANGE WORLD
The Quest for the 'Real' Robin Hood
MASSIMO POLIDORO 22

PSYCHIC VIBRATIONS
First They Came for Darwin,
Then They Came for Copernicus and Galileo . . . .
ROBERT SHEAFFER 24

SKEPTICAL INQUIREE
Might Fright Cause White?
BENJAMIN RADFORD 26

FORUM
Why I Burned a Bible
JOE SZIMHART 58

Getting It Right, or Brooklyn Is Not Expanding
RALPH ESTLING 59

The PhD Degree and Biblical Fundamentalism
WILLIAM D. STANSFIELD 61

The Two-Months Argument for Parapsychological Research
JESPER JERKERT 62

LETTERS TO THE EDITOR 65

BOOK REVIEWS

The Stem Cell Controversy: Debating the Issues, 2nd Edition
By Michael Ruse and Christopher A. Pynes
KENNETH W. KRAUSE 51

An Illusion of Harmony: Science and Religion in Islam
By Taner Edis
HARRY EAGAR 53

Dark Ages: The Case for a Science of Human Behavior
By Lee McIntyre
PETER LAMAL 54

Blind Faith: The Unholy Alliance of Religion and Medicine
By Richard P. Sloan
KENNETH W. KRAUSE 55

The Power of Critical Thinking: Effective Reasoning about Ordinary and Extraordinary Claims
By Lewis Vaughn
DAVID W. CLAPSADDLE 57

Editor's Note

Hope for the Future, and Early Reaction on Global Warming

I just got back from talking with some of the world's brightest high-school students. It's enough to restore faith in the future. The occasion was the International Science and Engineering Fair (ISEF), where 1,500 students came to display and defend their science projects. ISEF is sponsored by Intel and administered by Science Service. Science Service publishes *Science News*, where I hung my hat for many years before joining SI. But until now I'd never had the opportunity to attend an ISEF. The event came to me this time, in Albuquerque. I'd been anticipating it ever since being struck by the enthusiasm in 2004 of two dedicated high-school teachers who have been working full time since then as the local organizers.

The students I talked to were filled with passion as they described their research and answered my questions. They are intelligent, of course, but, more important, they demonstrated curiosity, determination, perseverance, and resourcefulness. It isn't easy doing science, but these young men and women (many were female) had these qualities and had done what it takes. One girl had been developing her project for six years now. And somehow they had all gained access to good scientific laboratories, in universities, government, or industry, and their data and equipment. It is so important to help and encourage motivated young people like this. Its payoff is our own future. Such students need not become professional scientists to have their experience benefit us all. Their deep immersion in the processes of science, if only for a time, will make them better citizens the rest of their lives.

* * *

Critical e-mails from readers skeptical of global warming began arriving as soon as our May/June 2007 cover story on the subject began reaching them. They are furious. Almost all began by expressing disappointment, even anger, that a magazine with *skeptical* in its title hadn't debunked what they obviously think of as a myth. Two canceled their subscriptions. Most didn't refer to the detailed scientific information in our cover article by NASA scientist Stuart Jordan or in the excerpts we presented from the latest IPCC report. So I couldn't tell if they'd even read the articles. One did admit he (they were all males) hadn't gotten beyond the third paragraph. And all this before we even publish, in this issue, Part 2 of Jordan's report. (We publish about half of his second half; we've omitted a section on mitigating global warming, for space and because, in SI, for now, I want to focus on the science. But the whole thing is available on the Web.)

A couple of points: skepticism is not a position but a determination to use science and reason in arriving at conclusions. Science is a methodology, not an ideology. Evidence prevails. Jordan's report is an attempt to present the current status of the best peer-reviewed scientific evidence. If, in the future, new and better evidence shows that global warming is all a myth and chimera, in marked contrast to the situation now, we'll be right there reporting on that. In the meantime, we'll continue to present and evaluate the best evidence on these and other important controversies.

Skeptical Inquirer
THE MAGAZINE FOR SCIENCE AND REASON

EDITOR
Kendrick Frazier

EDITORIAL BOARD
James E. Alcock
Barry Beyerstein
Thomas Casten
Martin Gardner
Ray Hyman
Paul Kurtz
Joe Nickell
Lee Nisbet
Amardeo Sarma
Benjamin Wolozin

CONSULTING EDITORS
Susan J. Blackmore
John R. Cole
Kenneth L. Feder
C. E. M. Hansel
Barry Karr
E. C. Krupp
Scott O. Lilienfeld
David F. Marks
Eugenie Scott
Richard Wiseman

CONTRIBUTING EDITORS
Austin Dacey
Chris Mooney
James E. Oberg
Robert Sheaffer
David E. Thomas

MANAGING EDITOR
Benjamin Radford

ASSISTANT EDITORS
David Park Musella
Andrea Szalanski

ART DIRECTOR
Lisa A. Hutter

PRODUCTION
Christopher Fix
Paul Loynes

EDITORIAL ASSISTANT
Julia Lavarnway

CARTOONIST
Rob Pudim

WEB-PAGE DESIGN
Patrick Fitzgerald, Designer
Amanda Chesworth

PUBLISHER'S REPRESENTATIVE
Barry Karr

CORPORATE COUNSEL
Brenton N. VerPloeg

BUSINESS MANAGER
Sandra Lesniak

FISCAL OFFICER
Paul Paulin

VICE PRESIDENT OF PLANNING AND DEVELOPMENT
Sherry Rook

DATA OFFICER
Jacalyn Mohr

STAFF
Darlene Banks, Patricia Beauchamp, Cheryl Catania, Matthew Cravatta, Sarah Pierce, Sara Rosten, Debbie Ryan, Anthony Santa Lucia, John Sullivan, Sheryl Tash, and Vance Vigrass

PUBLIC RELATIONS
Nathan Bupp
Henry Huber

EDUCATIONAL DIRECTOR
Amanda Chesworth

INQUIRY MEDIA PRODUCTIONS
Thomas Flynn

DIRECTOR OF LIBRARIES
Timothy S. Binga

The Skeptical Inquirer is the official journal of the Committee for Skeptical Inquiry, an international organization.

New Findings Show Some Improvements in U.S. Science Literacy

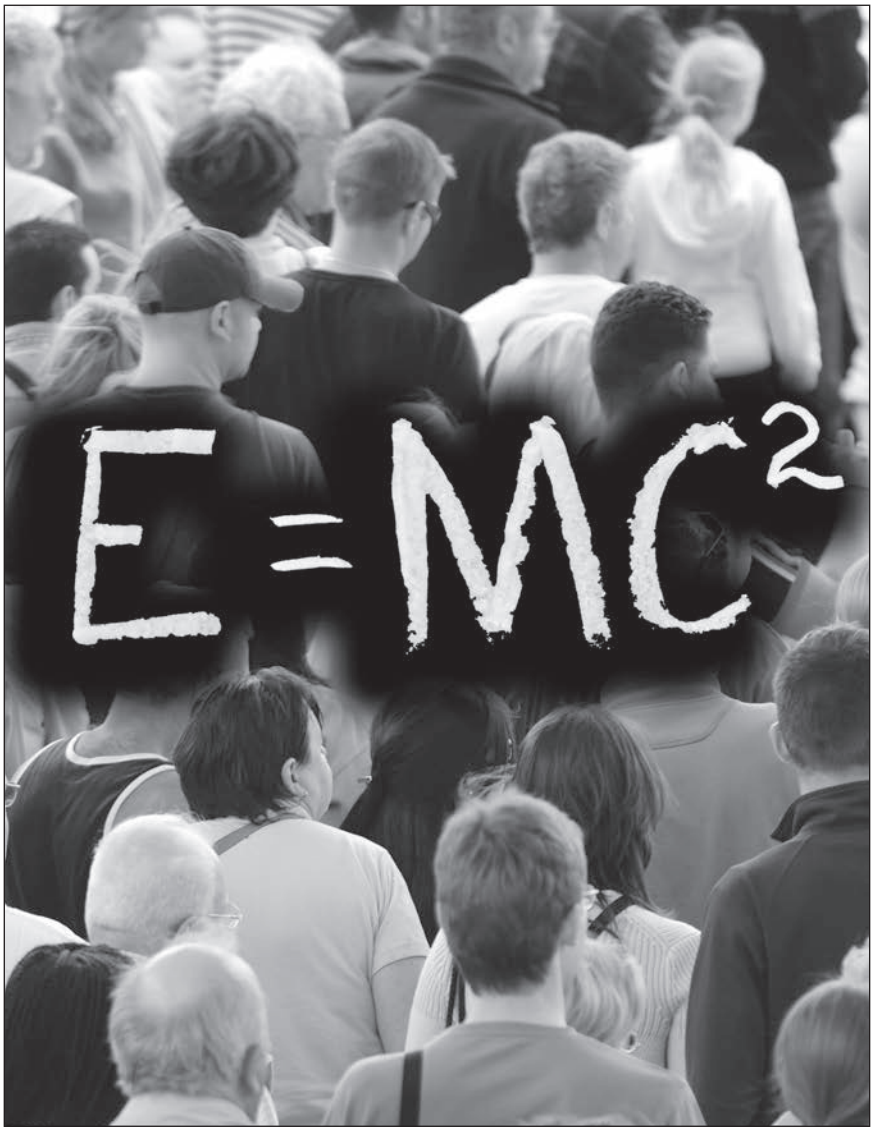
A session at the 2007 American Association for the Advancement of Science annual meetings in San Francisco in February reported on research concerning cohort effects for scientific literacy in the United States and Europe, and their relation to beliefs in pseudoscience. The session was organized by Raymond Eve, professor of sociology at the University of Texas at Austin. He also participated in a press briefing on the session at the meeting.

For the first time, Eve and his fellow researchers have begun to examine how science literacy scores on standardized tests may be partially due to generational or cohort effects. In other words, most of our grandparents didn't even attend college, so it would be surprising if today's generation didn't outscore previous ones. Such research is beginning to make it possible to separate out the effects of innovations in the teaching of science from improvements that might have occurred due to generational effects.

The researchers found that in spite of the mass media's regular litany of doom and gloom about science education in the U.S. recent innovations in teaching science seem to be paying off in somewhat better scores for students, scores that can be attributed to better science teaching—not just cohort effects. The same also applies to the recently reduced belief in pseudoscience, particularly for topics unrelated to religiously influenced pseudoscientific beliefs.

One finding by the panel was that U.S. high school students are leaving high school dramatically unprepared for scientific literacy, but that both at the high school and college levels the situation is improving somewhat. In fact, the percentage of Americans with basic scientific literacy has almost tripled in the last two decades.

As a somewhat surprising result, brand new research presented at the meetings by panel participant Jon D. Miller of Michigan State University shows U.S. *adults* to now be second in the world in terms of science literacy (behind only Sweden), although this still represents only 28 percent of the total U.S. population. Interestingly, since this is apparently not attributable to high-school preparation per se, Miller said it appears that taking even one course in science in college leads students to become self-educators in science throughout life. (Meaning, for example, that if one gets cancer it doesn't take long for them to use secondary sources from the Internet and elsewhere to soon know a lot about medicine.) Hence, we now need much better understanding of how a college education can lead to lifelong learning in science and how best to integrate collegiate science learning with informal science learning once out of the academic environment.



'Court TV' Psychic Loses to Skeptic in Real Court

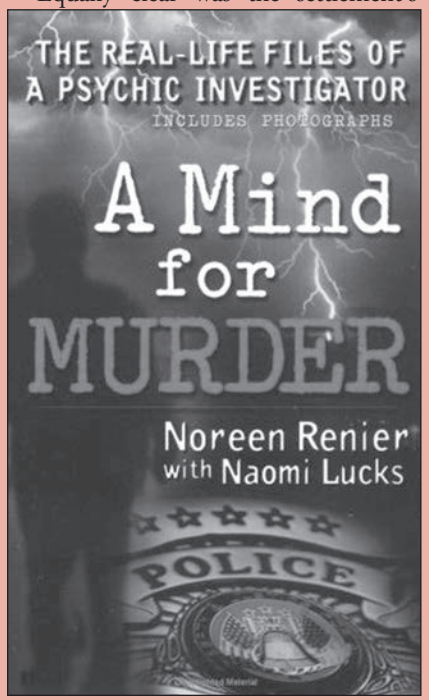
The epic legal wranglings between "psychic detective" Noreen Renier and skeptic John Merrell, which have spanned two decades in county, state, and federal courts from Orlando to Seattle, may have finally come to an end—though not with the results predicted by the psychic.

Renier, who has been featured in numerous episodes of Court TV's pro-paranormal *Psychic Detectives* series, probably trails only Sylvia Browne as America's—and perhaps even the world's—best-known self-styled psychic sleuth. But even Browne is notorious for some well-publicized psychic stink bombs, so it's understandable that Renier might have been clueless that she would get killed in court over the publication of *A Mind for Murder,* her 2005 memoir.

Renier's book was promptly pulled when the publisher learned, from Merrell's attorney, that Renier and Merrell had signed a settlement agreement in 1992 prohibiting either party from ever again publicly disparaging the other. Renier had won a $25,000 libel judgment against Merrell in 1986, which he unsuccessfully contested in two courts, and this settlement, which also included a $23,800 payment to Renier, was to have finally put their battles to bed. It shouldn't take an attorney, much less a psychic, to recognize that *A Mind for Murder*'s two chapters devoted to Renier's history with Merrell, in which she accuses him of lying in court and other misconduct, was a flagrant violation of that agreement. Merrell thus sued Renier in December 2005 for breach of contract.

As the case played out in U.S. District Court in Washington state, where Merrell now resides, a posting (subsequently removed) by Renier on her Web site placed the blame on her *publisher* for having "neglected to spot the problem that was to materialize in this latest lawsuit, although they were told to be very careful." I'm no psychic (I don't even play one on TV), but I sense that they might have spotted the problem had Renier spotted them a copy of her unambiguous, legally binding settlement agreement.

Equally clear was the settlement's



stipulation that, should someone breach the contract, thus precipitating a lawsuit, the prevailing party's legal fees would be reimbursed by the breaching party. Yet again, Renier's position strained credulity, with her attorney insisting that, because Merrell failed to claim any substantial monetary damages and his complaints against Renier's publisher and coauthor had been dismissed, Merrell was *not* the prevailing party. This was in spite of the judge's earlier pronouncement that "Ms. Renier breached the agreement."

Judge James L. Robart's final ruling, issued on April 5, 2007, reaffirmed that Renier was the breaching party, Merrell was the prevailing party, and that Renier was obligated to reimburse Merrell for his attorney's fees and other legal costs in the amount of $39,558. All of Renier's counterclaims were denied. Her book has not been rehabilitated, and her own legal fees are estimated to exceed $35,000.

On his own Web site, Merrell has floated two intriguing, though somewhat fanciful, ideas for Renier to ponder. The first has her coauthoring another book, this time with a skeptic like me or Joe Nickell, revealing "how international psychics have fooled the public and media." The second has Merrell agreeing to donate $10,000 in Renier's name to a children's charity and erasing her $39,558 debt entirely, should she in a timely manner be able to "prove under a qualified and sanctioned test something as simple as her claims of human levitation, psychic sight through clothing, or her two-way communication with trees." The former—*if* Renier is consciously aware, and agreeable to confessing, that she is no more "psychic" than the rest—could have best-seller potential. The latter, on the other hand, would require that Renier actually *demonstrate* psychic ability under properly controlled conditions, and, based upon my own personal history with her, my money says she wouldn't dare make the attempt—not even for Randi's $1,000,000 reward.

—Gary Posner

Gary Posner, M.D., is founder of Tampa Bay Skeptics and a CSI scientific consultant. His extensive writings on Renier, including coverage of her litigation history with Merrell, can be found at http://members.aol.com/garypos/Renier_list.html.

CSI Executive Council Members Meet in D.C., Speak on Restoring Scientific Integrity

Members of the Committee for Skeptical Inquiry's Executive Council and others spoke on "Restoring Scientific Integrity" at a morning-long session in Washington, D.C., on March 31. The informal session took place at the Center for Inquiry's new Office of Public Policy (OPP) on Capitol Hill, 621 Pennsylvania Avenue SE.

Speakers and their topics included:

Barry Karr, CSI executive director, introduced the session and offered the best wishes of chairman Paul Kurtz, who was recovering from heart surgery that took place three weeks earlier.

Toni Van Pelt, the OPP policy director: how OPP was created and its recent activities.

Kendrick Frazier, editor, SKEPTICAL INQUIRER: defending good science in the public-policy arena (the examples used were global warming, evolution, and alternative medicine).

Chris Mooney, author of *The Republican War on Science* and the forthcoming *Storm World: Hurricanes, Politics, and the Battle over Global Warming*: abuses of science by political parties and how scientists can better frame issues.

Ray Hyman: parapsychology's Achilles heel ("consistent inconsistency").

Ron Lindsay, OPP Legal Director: the current status of legislation for funding embryonic-stem-cell research.

James Alcock: why alternative medicine is so popular.

Thomas Casten: how policies regulating the power industry encourage inefficiencies and whether mitigating global warming should cost money.

Benjamin Wolozin: the power of prediction in science.

Amardeo Sarma: homeopathy as an example of prominent support for dubious claims.

Barry Beyerstein: "The Sins of Big Pharma."

Following the public meeting, the Executive Council held a business meeting in the same location.

Feng Shui and Monkey Madness at the L.A. Zoo

It sounded like a joke. Early in March, my office started receiving calls that the L.A. Zoo had hired a feng shui practitioner to help design their new $7.4 million monkey habitat. One CFI supporter said, "I know you guys are busy, but it kills me to think they are going to put feng shui info on a zoo information sign!" But it was no joke. The zoo dropped a cool $4,500 on a Beverly Hills feng shui master to help ensure that the valuable Chinese golden monkeys, due to arrive in 2008, will feel right at home.

Feng shui is the ancient Chinese art of creating living space that's in harmony with the universal energy, or *qi*, that supposedly flows through it. The practice dates back to the twelfth century and incorporates aspects of astrology, luck, and aesthetics. The aesthetic value of feng shui might have some merit, depending on the individual making the decorating decisions, but scientists are still waiting to see evidence that *qi* even exists, much less that it influences one's romantic or financial condition. Besides, there are different schools of thought in feng shui, and masters advising on identical environments have been shown to radically disagree on what changes should be made. (See the episode of *Penn and Teller: Bullshit!* illustrating this.)

If the value of feng shui for humans is dubious, the joy that it brings into monkeys' lives seems, shall we say, yet to be established. Indeed, I invite any scholarly research on monkey luck and any evidence showing baboon behavior changing with the alteration of a door's location.

Since science seemed to be escaping from the zoo, it was time for a visit from CFI. I was the first community speaker to be heard at the zoo's March 20 Board of Commissioners meeting and was allowed three minutes to try to convince the commissioners that feng shui wasn't worth forty-five cents, much less $4,500.

To her credit, one commissioner said she was surprised at hearing this had been approved. The zoo staff member who green-lighted the feng fee was not present to defend him or herself, but another staffer said it was an effort to replicate the cultural aspects of a rural Chinese village where these monkeys are from. "Why not just hire someone to recreate the *look* of a village," I asked. "You don't need all that 'energy' mumbo jumbo to make it look the same."

They seemed to agree, and I got the distinct impression there was at least a hint of embarrassment over the whole affair. We can only hope. . . .

—Jim Underdown

Jim Underdown is the executive director of the Center for Inquiry/West in Los Angeles.

Philadelphia Psychics Shut Down, Then Allowed to Reopen

In late April 2007, citing a state law banning fortune-telling for profit, Philadelphia's Department of Licenses and Inspections (L&I) set about closing storefront psychics, astrologers, and palm readers.

Oddly, many psychics were surprised by the crackdown. One unnamed psychic complained, "What we do is entertainment. Shouldn't they be cracking down on rapes and murders, not palm readers?" Yet it's not palm reading, per se, that police are concerned about, it's the con games, theft by deception, and fraud that often accompany fortune-telling. The police did not arrest the psychics but warned that they would be arrested if they resumed their activities.

According to Deputy L&I Commissioner Dominic E. Verdi, "the Police Department came to us . . . and showed us where the crime code prohibits psychic readings. We looked into it, and it's clearly illegal." According to Pennsylvania Consolidated Statutes (Crimes and Offences, Title 18 § 7104)

> A person is guilty of a misdemeanor of the third degree if he pretends for gain or lucre, to tell fortunes or predict future events, by cards, tokens, the inspection of the head or hands of any person, or by the age of anyone, or by consulting the movements of the heavenly bodies, or in any other manner, or for gain or lucre, pretends to effect any purpose by spells, charms, necromancy, or incantation, or advises the taking or administering of what are commonly called love powders or potions, or prepares the same to be taken or administered, or publishes by card, circular, sign, newspaper or other means that he can predict future events, or for gain or lucre, pretends to enable anyone to get or to recover stolen property, or to tell where lost property is, or to stop bad luck, or to give good luck, or to put bad luck on a person or animal, or to stop or injure the business or health of a person or shorten his life, or to give success in business, enterprise, speculation, and games of chance, or to win the affection of a person, or to make one person marry another, or to induce a person to make or alter a will, or to tell where money or other property is hidden, or to tell where to dig for treasure, or to make a person to dispose of property in favor of another.

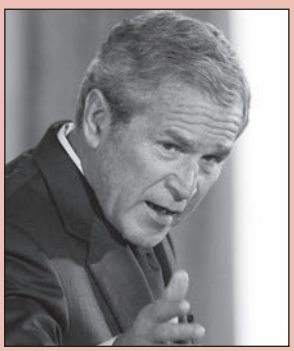
The victory of prudence over psychics was short-lived: the crackdown was in effect for less than a week before being overturned. Monica Mitchell, who operates a storefront shop as a psychic, contacted her lawyer, who filed a request for a restraining order and preliminary injunction. Legal rationale for overturning the decision was based essentially on a technicality: her lawyer, John Raimondi, argued that, because the law banning fortune-telling was part of the criminal code (and not a regulation code), it was not enforceable by the licensing department. According to Raimondi, "You have to prove that someone has been taken advantage of, and you can't expect L&I to enforce that."

Philadelphia city lawyers agreed, and the order was issued to halt the shuttering of psychics' windows. Divisional deputy city solicitor Andrew Ross said, "We felt it was hard to say what kind of evidence might be needed to prove someone was pretending to tell fortunes." In fact, one or more well-controlled tests could prove whether or not the alleged psychics are only pretending to tell fortunes.

This case is only the most recent defeat in the effort to put those who offer services they can't prove they provide out of business. In past years, police efforts have met with limited success. In 2004, a fortune-teller was allowed to open a booth at a county fair near Chicago despite an ordinance banning psychics and fortune-tellers (see "Fortuneteller Allowed at Fair Despite State Law," November/December 2004); and, in 1999, a Louisiana judge struck down a 1982 ban on palm readers and fortune-tellers (see "Fortunetelling Ban Lifted in Louisiana," March/April 2000). In one recent case in Texas—the subject of a SKEPTICAL INQUIRER article—the theft conviction of an alleged psychic was overturned because of prosecutorial incompetence: the district attorney's office erred in charging her with theft by coercion instead of theft by deception. (See "Psychic Swindlers," May/June 2005; "'Psychic Swindler' in San Antonio Convicted of Theft by Coercion," November/December 2005; and "Psychic Evans Acquitted on Appeal in Swindling Case," May/June 2007.) Until and unless the legal system takes fortune-telling and theft by deception seriously, more innocent people will lose fortunes while seeking them.

—Benjamin Radford

Benjamin Radford has written about and investigated psychics for over a decade; he predicts that psychics will continue to deceive



Stem Cells: President Bush Vows to Protect One-Celled People

The Stem Cell Research Enhancement Act passed the Senate 63 to 34, but President Bush promises a veto. He said the use of embryonic stem cells in research "crosses a moral line." In case you're wondering where this "moral line" is drawn, George W. Bush and other conservative theologians believe a "soul" is assigned to the fertilized egg at the instant of conception. That makes it a person, even though it's not counted in the census. In-vitro fertilization makes a lot more of these one-celled people than it needs; leftovers are stacked in the freezer until it starts filling up. President Bush cares deeply about these helpless one-celled people and wants to ensure they are properly flushed down the disposal rather than exploited by godless scientists interested only in the reduction of suffering.

—Robert L. Park, "What's New" (whatsnew@bobpark.org), April 13, 2007

Psychic Events Workshop Fails APA Curriculum Requirement

A continuing-education workshop titled "Coming to Our Senses: Psychic Events in the Lives of Clinicians and Clients" was touted in North Carolina this year by Beth Wechsler, MSW. According to the brochure, the topics to be covered included an account of the nature of ESP (with perspectives from parapsychology and quantum physics, as well as material from Einstein, Edison, and Jung), ESP and medicine, psychics and mediums (and how to detect fakes!), telepathy, precognition, and apparitions. Personal experiences of individuals such as Elisabeth Kubler-Ross and Jane Goodall also would be presented.

The workshop's sponsor was PESI, LLC, which, according to its Web site, provides "quality continuing education to nursing, mental health, legal, business, education, real estate, and other professionals nationwide." Contacted about the content of the workshop, Cindy King, of PESI customer service, stated that PESI, LLC, makes no claims about the scientific basis of the research provided in the psychic events workshop. She indicated that PESI, LLC, provides a number of other workshops that are scientifically based but that many customers enjoy other types of workshops.

It's disconcerting that a psychic events workshop that the sponsor indicates is not necessarily scientifically based is offered simply because it is enjoyed by customers. The fact that continuing education credit for this workshop would be granted to psychologists, counselors, nurses, social workers, and marriage and family therapists is appalling.

An e-mail addressing the content of the workshop was sent to the associations and boards that had designated PESI as an approved provider. Karen Kanefield, the director of the Continuing Education Sponsor Approval System of the American Psychological Association, responded immediately. She said that the content of the psychic-events workshop does not meet the curriculum-content requirements of the APA and that PESI would be informed that the workshop "is not suitable as continuing education for psychologists."

An answer from Anne Garfield, Recertification and Continuing Education Assistant for the National Board for Certified Counselors (NBCC), was not so direct. Garland indicated that she would followup with PESI to get further information. Garland and Pamela Leary, NBCC Credentialing Services Department administrator, reviewed the presentation materials and concluded that although the topic of psychic events is "uncomfortable" for many people and not "completely in the mainstream" the information to be presented came from "noteworthy sources" including Einstein, Edison, Freud, Jung, Margaret Mead, and Elisabeth Kubler-Ross. Garland said the *Journal of the American Medical Association* (*JAMA*) and the *American Journal of Psychiatry* are referenced throughout the presentation and that much of the presentation is based on work from the Rhine Research Center at Duke University.

In a follow-up e-mail to Garland, it was pointed out that the fact that Jane Goodall and other "noted and respected" individuals believe that they have experienced psychic events does not make such events scientifically valid. Furthermore, the Rhine Research Center is no longer affiliated with Duke University, and the most recent research conducted at the Rhine Center—in the words of the parapsychological researchers themselves—reveals weak effects, no effects, or "controversial" results. Furthermore, Garland was informed that a search of *JAMA* and the *American Journal of Psychiatry* for information on psychic phenomena revealed eleven articles published between 1972 and 1985. Of the eleven articles, seven report on actual studies of psychic phenomena. Without exception, the research involved retrospective, anecdotal accounts of events—weak methodology with virtually no controls. Garland responded immediately and said that they would reexamine the presentation "in greater detail" based on the additional information that had been provided. However, a follow-up e-mail to Garland regarding the results of the reexamination went unanswered.

To have such a workshop considered for presentation is cause for alarm. But the fact that the APA deemed the workshop inappropriate for continuing-education credit and that the NBCC agreed to reexamine the workshop are promising and positive steps. Perhaps we have taken a step toward indeed "coming to our senses."

—Yancy B. McDougal

Yancy B. McDougal is a professor and the chair of the Department of Psychology, University of South Carolina Upstate, Spartanburg, South Carolina. E-mail: ymcdougal@uscupstate.edu. □

IGNITE THE ADVENTURE

The New Future Fund

"Knowledge is an unending adventure at the edge of uncertainty."

– Jacob Bronowski, scientific polymath

For a more rational tomorrow … and the future of Skeptical Inquirer … please support the new phase of the Center for Inquiry New Future Fund

Across our world, forward-thinking men and women have recognized the scientific paradigm as their surest guide for sound thinking and living. For them knowledge is the greatest adventure. Today the Center for Inquiry movement strives to keep the adventure of knowledge accessible to all. To defend science, reason, freedom of inquiry, and human values in an ever-changing world, we must adopt new methods … new approaches. To realize tomorrow's ambitious goals, we must expand our organization.

The New Future Fund is an audacious, multiyear $26.265 million campaign to fund program needs, capital expansion, and endowment for the Committee for Skeptical Inquiry (CSI) and the Center for Inquiry.

In this new phase the focus turns to:

- Outreach and education: publishing, media relations, personal outreach, and more
- Influencing public policy through our new Center in the nation's capital
- Enhancing the Committee for the Scientific Examination of Religion (CSER)
- The Naturalism Research Project: library expansion, research fellowships, and other initiatives to spur exploration of the naturalist tradition
- Transnational Development: reaching beyond borders through the United Nations and direct activism around the globe

As always, the New Future Fund supports new and established programs, including Skeptical Inquirer and CSI's vital media and public education work. Because our work is so vitally important, please make your most generous gift today to support program expansion. By pledging a larger gift over a three-or four-year period, you may find a significant contribution more affordable. Our development staff stands ready to answer questions you may have about asset transfers, planned giving arrangements, and the like. All gifts are fully tax-deductible to the extent allowed by law.

For more information or to make a gift, return the tear-out card facing this ad or contact:
Center for Inquiry
Department of Development P.O. Box 741, Amherst NY 14226-0741
1-800-818-7071 | development@centerforinquiry.net

CENTER FOR INQUIRY

CSI Committee for Skeptical Inquiry

Toni Van Pelt, Paul Kurtz, and Ron Lindsay (standing); Lawrence Krauss, David Helfland, and Nobel Laureate Paul Boyer (seated) introduced the Declaration in Defense of Science and Secularism at the inaugural press conference of the Center for Inquiry/Office of Public Policy in Washington, D.C.

Local leaders, campus activists, and students from around the world came together at CFI's 2006 Summer Session.

Latin American and U.S. skeptical activists met at the CFI-sponsored First Iberoamerican Conference on Critical Thinking in Peru.

The new Naturalism Research Project will more than double our library facilities and create a collegial setting for scholarly dialogue and research.

Onward Science Soldiers

VICTOR J. STENGER

In a poll taken in 1998, only 7 percent of the members of the U.S. National Academy of Sciences, the elite of American scientists, said they believed in a personal God (Larson and Witham 1998). While the percentage is undoubtedly greater in the U.S. scientific community as a whole, it is probably safe to say that the majority of American scientists are nonbelievers, in marked contrast to the general public.

Nevertheless, most scientists seem to prefer as a practical matter that science should stay clear of religious issues. This is a good strategy for those who wish to avoid conflicts between science and religion, which might lead to less public acceptance of science and that most dreaded of all consequences—lower funding. However, religions make assertions about the natural world, and these have no special immunity from being examined under the cold light of critical analysis. Scientists are abdicating their responsibilities when they avoid applying their expertise to evaluate religious claims that can be tested against empirical facts, especially when religious thinking is used to override science in the making of public policy.

In one of its official statements supporting evolution, the Academy states, "Science is a way of knowing about the natural world. It is limited to explaining the natural world through natural causes. Science can say nothing about the supernatural. Whether God exists or not is a question about which science is neutral" (National Academy of Sciences 1998). This is simply untrue. Not only can science examine any claim that bears on empirical data, reputable scientists from reputable institutions are doing just that, for example, in experiments on the efficacy of intercessory prayer.

In the battle between evolution and creationism, the political strategy adopted by many scientific organizations such as the Academy and the National Center for Science Education has been to seek support of Catholics and moderate Christians whose clergy have stated their support for evolution. The uncomfortable fact that evolution implies humanity is an accident, rather than the special creation of God in his own image, is conveniently swept under the rug.

But there are worse things happening in America and the world as the direct result of religious thinking than children hearing the dreaded word *creation* in the classroom. Both abroad and at home, we are engaged in cultural wars that threaten the very existence of secular society and the health, safety, and well-being of humans everywhere. Islamic radicals have declared war on the modern world and are steadily gaining adherents in all countries with large Muslim populations. George W. Bush's "War on Terror," which he has characterized in religious terms as a holy war of good against evil, has advanced rather than deterred this trend.

The born-again U.S. president has based his policies, foreign and domestic, on faith rather than evidence—faith that his own instincts are divinely inspired and any evidence that contradicts these instincts may be ignored and even suppressed.

A series of recent books has extensively documented how a small group of influential Christian extremists, with large financial resources at their disposal, have taken control of the Republican party and used churches to build enough support at the polls to gain control of the White House and Congress in 2000 and 2004 (Mooney 2005, Phillips 2006, Goldberg 2006, Linker 2006, Hedges 2007). Only with the 2006 midterm election has their influence slipped. But this may be attributed to the unmitigated disaster of Iraq rather than any sea change in public opinion. You can bet these groups have not thrown in the towel on their goal of converting America to a Christian theocracy.

Let me list some examples of Bush policies that are founded in theology rather than evidence and how he and his administration have acted to suppress scientific studies that contradict the faith-based assumptions that lie behind these policies.

In one of his first acts as president, Bush restored a gag rule on aid to international organizations that counsel women on abortion. Of millions of dollars spent on preventing and treating AIDS in Africa, 30 percent was earmarked for promoting sexual abstinence and none for condoms. Here at home, $170 million was spent in 2005 alone on promoting abstinence-only sex education in schools. The Centers for Disease Control and Prevention was pressured to remove from its Web site scientific findings that abstinence-only programs do not work. According to a 2003 report issued by Democratic Congressman Henry A. Waxman and the minority staff of the Government Reform Committee, the Bush administration modified performance measures for abstinence-based programs to make them look effective.

Similarly, under pressure from conservatives in Congress, a National Cancer Institute Web site was changed to reflect the view that there may be a risk of breast cancer associated with abortions, a claim made by evangelicals that has no scientific support (Mooney 2005, pp. 206–207).

Bush's obstruction of stem-cell research, which holds promise to provide a wide range of therapies, is based on the theological view that a 150-cell embryo contains a human soul. While scientists may prefer to remain neutral on the matter of souls, they should point out that an embryo cannot suffer while stem-cell research could result in the reduction of real suffering in fully developed humans

Victor J. Stenger's latest book, God: The Failed Hypothesis—How Science Shows that God Does Not Exist*, has made the* New York Times *bestseller list.*

(Harris, 2005, pp. 165–167; Mooney 2006, pp. 185–204).

Bush's appointee to the Food and Drug Administration's Reproductive Health Drugs Advisory committee, gynecologist W. David Hager, is an evangelical who prescribes Bible readings to treat premenstrual syndrome. Hager was primarily responsible for the FDA blocking over-the-counter sales of the birth-control drug known as Plan B. This was despite testimony before his committee by a scientific advisory panel that "Plan B was the safest product that we have ever seen brought before us" (Mooney 2005, pp. 215–220).

Evangelicals have also influenced Bush administration policies on the environment, leading the White House to intervene in 2003 to remove cautions against global warming from a report on the environment (Mooney 2005, p. 90). More recently, Bush has seemed to make an about-face on global warming, but NASA is still delaying or canceling a number of satellites designed to obtain critical information on Earth climate. Bush gives the space station higher priority, despite the fact that a consensus of scientists regard it as scientifically useless.

In October 2005, George Deutsch, a presidential appointee at NASA headquarters, sent an e-mail message to Flint Wild, a NASA contractor working on a set of Web presentations for middle-school students. The message said the word *theory* should be added after every mention of the Big Bang. The Big Bang is "not proven fact; it is opinion," Mr. Deutsch wrote, adding, "It is not NASA's place, nor should it be, to make a declaration such as this about the existence of the universe that discounts intelligent design by a creator" (Revkin 2006b). This was just another instance where NASA scientists were pressured to limit discussions on topics uncomfortable to the Bush administration, including global warming (Revkin 2006a).

While scientists have begun to speak out on these issues, they have not directly confronted the religious thinking that forms the basis of these policies. Presumably, they fear offending "deeply held beliefs." I am pleading that religion no longer be given this free ride. The stakes are too high.

Let science compete with religion in the marketplace of ideas. Scientists should question religious assumptions just as they question those of other scientists. And they should vigorously protest whenever faith is used to suppress sound scientific results.

References

Goldberg, Michelle. 2006. *Kingdom Coming: The Rise of Christian Nationalism.* New York: W.W. Norton.

Harris, Sam. 2005. *The End of Faith: Religion, Terror, and the Future of Reason*. New York: W.W. Norton.

Hedges, Chris. 2007. *American Fascists*. New York: Free Press.

Larson, Edward J., and Larry Witham. 1998. Leading scientists still reject God. *Nature* 394:313.

Linker, Damon. 2006. *The Theocons: Secular American under Siege*. New York: Doubleday.

Mooney, Chris. 2005. *The Republican War on Science*. New York: Basic Books.

National Academy of Sciences. 1998. *Teaching about Evolution and the Nature of Science.* Washington, D.C: National Academy of Sciences: p. 58. Available at: www.nap.edu/catalog/5787.html; accessed March 5, 2006.

Phillips, Kevin. 2006. *American Theocracy: The Peril and Politics of Radical Religion, Oil, and Borrowed Money in the 21st Century*. New York: Viking Penguin.

Revkin, Andrew C. 2006a. Climate expert says NASA tried to silence him. *The New York Times*. January 29.

Revkin, Andrew C. 2006b. NASA chief backs agency openness. *The New York Times*. February 4. □

The Center for Inquiry/Transnational presents its Eleventh World Congress

"Scientific Inquiry and Human Development" Conference

October 13–15, 2007
Beijing, China

Hundreds of scientists and scholars from all over the world and all walks of life will convene. Topics to be discussed include: Scientific Inquiry and the World's Harmonious Development; Science and the Public; Scientific Method and Scientific Attitudes; Scientific Culture and Ethics; Science and Pseudoscience around the World. Speakers include: **Paul Kurtz, Daniel C. Dennett, Jean-Claude Pecker, Mario Bunge, Lawrence M. Krauss, Nobel Laureates Murray Gell-Mann and Harry Kroto,** and many more!

For more information, or to register online, please visit:
http://www.centerforinquiry.net/china/

Little Audrey: The Life and Death of a 'Victim Soul'

JOE NICKELL

A milestone in supernatural claims has been reached: Audrey Santo—the brain-damaged girl in Worcester, Massachusetts, who, supposedly, exhibited stigmata, prompted effigies to drip oil and communion wafers to bleed, and miraculously sparked healings of the sick—died on April 14. She was twenty-three.

Known as "Little Audrey," she had been in a comalike state since August 9, 1987, when, at the age of three, she suffered a near-drowning. Controversy began a year after the accident, when her mother, Linda, spent $8,000 to take her to the shrine at Medjugorje, Yugoslavia, in hopes of a miracle. Instead, Audrey suffered a sudden cardiac arrest. Although she survived, the air ambulance that was needed to rush her home cost $25,000—a sum her grandmother had to mortgage her home to pay. Linda Santo's response to the near-fatal incident was to blame it on the proximity of a Yugoslavian abortion clinic (Harrison 1998; Sherr 1998).

Soon, Audrey was being promoted as a "victim soul." However, Catholic theologians, observing that that term was not an official one within the Church, questioned whether Audrey demonstrated the capacity—at the age of three or later—to make a free choice to suffer on behalf of others.

After Audrey was exhibited at a stadium with some 10,000 in attendance, and a window was added to her bedroom so that pilgrims could file by and pray for her to intercede with God on their behalf, the local bishop ordered that such practices be discontinued. Also curbed was the practice of offering oil-soaked cotton swabs as healing talismans. These restrictions may have diminished revenues, but the Santo family's situation was perhaps less financially desperate than many imagined, since Audrey received round-the-clock nursing care from the Massachusetts Commission for the Blind (Weingarten 1998).

I began to follow the Audrey Santo case as "miracle" claims about her proliferated. When an investigating commission appointed by the Worcester bishop issued a preliminary report on January 21, 1999, I appeared that evening on *The NBC Nightly News with Tom Brokaw* to offer a brief skeptical view of the case. For a later ABC *20/20* segment, a producer called and discussed with me the phenomenon of weeping icons in the Santo home. We considered monitoring the effigies with surveillance cameras, but I pointed out that, if trickery were involved, it was unlikely that such an investigative technique would be allowed. As Lynn Sherr subsequently reported on the program, "We wanted to do our own test with a surveillance camera in the [home] chapel, but the family prefers to let the commission finish its work first" (Sherr 1998).

On an episode of CBS's *48 Hours* titled "Desperate Measures" (1999), a reporter asked Linda Santo how one would know whether someone in the household was simply applying the oil "in the middle of the night." She replied, "You don't know." Samples of oil were independently tested on a few occasions. One analysis by a Pittsburgh laboratory revealed the substance to consist of 80 percent vegetable oil and 20 percent chicken fat, according to *The Washington Post*, which ordered the test (Weingarten 1998). The presence of chicken fat—which, along with common vegetable oil, is readily available in a home kitchen (consistent with chicken having been deep-fried)—seems particularly revealing. So does one volunteer's observation that there tended to be an increase in oil on effigies on the days pilgrims were expected ("Desperate" 1999).

Much later, when I was involved with a television documentary on the case, the producer tried to arrange for me to visit the Santo home. Linda Santo, I was told, was tentatively agreeable, but, after she consulted a priest who was a behind-the-scenes promoter of alleged phenomena there, she refused. I had clearly become persona non grata, no doubt because of my repeatedly voiced suspicions about the circumstances under which the icons and figurines dripped oil and the hosts (commu-

Joe Nickell is CSI's Senior Research Fellow and author of numerous investigative books, including Looking for a Miracle. *His Web site is at www.joenickell.com.*

nion wafers) supposedly bled. (I have observed that when I have unrestricted possession of a "miraculous" object it either ceases to perform or I explain the phenomenon [Nickell 2006]).

Miracle healings attributed to Audrey's intercession were also unconvincing. For example, a woman was supposedly healed of liver cancer, but the patient's oncologist pointed out that she had already begun a new cancer treatment and that it had clearly begun to work even before she had gone to see Audrey. The woman continued to regard the remission as a miracle even when the cancer returned, spreading to her brain ("Desperate" 1999). Again, there was the case of a young man injured in a motorcycle accident whose doctors reportedly said he would never walk again; yet, after his mother went to see Audrey, he was able to walk without his crutches. Actually, his personal physician noted that there had been a 75 percent chance that he would indeed walk (Sherr 1998).

Audrey's reputed stigmata was especially troubling. If faked, it indicated outright abuse. Therefore, not surprisingly, in 1999, the Santo case—perhaps unknown to most viewers—provided the impetus for an episode of the CBS television dramatic series, *Judging Amy*. As a researcher wrote CSI executive director Barry Karr, the show was to be "similar to the Audrey Santo story that Joe Nickell has been involved with" (Yeuell 1999). I subsequently discussed the case with the researcher and made some suggestions. Called "Victim Soul," the episode (airing on October 5, 1999) featured Judge Amy Madison Gray being challenged to "determine if a comatose boy who is believed to have healing powers is being abused by his grandmother" ("Victim" 1999).

I took no pleasure in my adversarial role as the arch skeptic in the Santo case. Indeed, I was deeply saddened by the family's plight: Far from receiving the miracle they prayed for, Audrey almost died from a trip to a healing shine, lingered in a persistent vegetative state for two decades, unknowingly suffered indignities and controversy, and finally died.

Her sad story has now ended. Although many have tried to find meaning in the tragedy, even Linda Santo wondered aloud: if there had not been phenomena like the "bleeding" communion wafers, she asked, "if there was just this child in bed, would anyone pay attention to this?" (Weingarten 1998)

References

Desperate measures. 1999. *48 Hours* (CBS-TV), June 24.

Harrison, Ted. 1998. Miracle child. *Fortean Times*, December, 40–41.

'Little Audrey' dies after being in a coma since 1987. 2007. Online at http://www1.whdh.com/news/articles/local/B049239; accessed April 16.

Nickell, Joe. 1999. Miracles or deception? The pathetic case of Audrey Santo. SKEPTICAL INQUIRER 23:5(September/October): 16–18.

———. 2006. The 'new' idolatry. SKEPTICAL INQUIRER 30:3 (May/June): 18–21.

Sherr, Lynn. 1998. The miracle of Audrey. *20/20* (ABC News transcript no. 1848), October 4.

Victim soul. 1999. Episode 4 of *Judging Amy*, CBS, aired October 5. See http://www.tv.com/judging-amy/victim-soul/episode/1754/summary.html?tag=ep_list;ep_title;3. Accessed April 17, 2007.

Weingarten, Gene. 1998. Tears for Audrey. *The Washington Post*, July 19.

Yeuell, Paul. 1999. E-mail to Barry Karr, July 8. □

You can make a lasting impact on the future of skepticism…

when you provide for the *Skeptical Inquirer* in your will.

CSI and the *Skeptical Inquirer* changed the terms of discussion in fields ranging from pseudoscience and the paranormal to science and educational policy. You can take an enduring step to preserve their vitality when you provide for the *Skeptical Inquirer* in your will.

Your bequest to CSI, Inc., will help to provide for the future of skepticism as it helps to keep the *Skeptical Inquirer* financially secure. Depending on your tax situation, a charitable bequest to CSI may have little impact on the net size of your estate—or may even result in a greater amount being available to your beneficiaries.

We would be happy to work with you and your attorney in the development of a will or estate plan that meets your wishes. A variety of arrangements is possible, including: gifts of a fixed amount or a percentage of your estate; living trusts or gift annuities, which provide you with a lifetime income; or a contingent bequest that provides for the *Skeptical Inquirer* only if your primary beneficiaries do not survive you.

For more information, contact Barry Karr, Executive Director of CSI, at **716-636-1425**. All inquiries are held in the strictest confidence.

Peru's Ancient Mysteries

Peru, like all the Americas, was relatively recently settled (an occurrence made possible by the last Ice Age, which allowed humans to cross the now-inundated Bering Land Bridge between present-day Russia and Alaska). A succession of native cultures flourished in various regions and eventually metamorphosed into the Inca Empire. This began in the Andean highlands circa 1200 A.D. and—by the Spanish Conquest of the 1530s—ranged from Ecuador south to Chile.

Ancient mysteries abound in Peru, several of which I was able to look into prior to speaking at the Second Ibero-American Conference on Critical Thinking held in Lima, August 3–5, 2006. Here, I report on the remarkable Nasca Lines, the oracle at the stepped-pyramid complex of Pachacamac, and the curiously fanciful Ica stones.

Figure 1. Giant Nasca spider is viewed from an airplane. Note the two parallel lines extending from the lower right leg. (Overflight photo by Benjamin Radford)

Nasca Lines

It had taken me years to arrive in Nasca (formerly "Nazca"), a dusty town in the San José desert made famous by its nearby enigmatic geoglyphs. These giant ground drawings—consisting of straight lines, great trapezoids, and stylized birds and other figures—were made by the pre-Incan Nasca culture that flourished in the area from 200 B.C. to about 600 A.D. Their graves and the ruins of their settlements lie near the drawings, and Nasca pottery shards are intermingled with the desert gravel.

The figures are so large they can only be properly viewed from the air (figure 1). Thus they have prompted crank notions that they were created by "ancient astronauts." That idea was hyped by the ridiculous—though worldwide-best-selling—*Chariots of the Gods?* written by Erich von Däniken (1970). A somewhat less absurd concept was still full of hot air: it held that the ancient Nascas had invented ballooning and made ceremonial flights over the *pampas* (Woodman 1977).

In my first article for the SKEPTICAL INQUIRER, I reported on my experimental re-creation in 1982 of one of the largest figures, the giant "condor" that measures some 440 feet from beak to tail. For a giant sketch pad, I used a landfill area near my childhood hometown, utilizing only a pair of crossed sticks (for sighting) and two knotted lengths of cord (for measuring). I discredited the idea that the Nascas used either the grid method of enlargement or a traverse surveying technique. Instead, I enlarged a small drawing by establishing first a center line, then measuring down it until directly opposite a desired point (for example, a wing tip), and again measuring from

Joe Nickell, PhD, is the author of numerous books, including Pen, Ink, & Evidence *and* Unsolved History. *His Web site is at www.joenickell.com.*

Figure 2. Author stands in his recreation of Nasca spider, made on a California ranch for National Geographic Television. (Photo by Joe Nickell)

Whereas the Nasca Lines are made by removing the dark desert gravel and thus exposing the lighter earth, we marked our figure with white lime, in the way one marks a playing field.

there to the point itself. We repeated the process on the ground, substituting *larger* units and finally connecting the points to complete the drawing (Nickell 1983). (My father handled most of the logistics, and my cousin Sid Haney the bulk of the construction work from our crew of six.) Whereas the Nasca Lines are made by removing the dark desert gravel and thus exposing the lighter earth, we marked our figure with white lime, in the way one marks a playing field.

We then flew over the area at about a thousand feet, the pilot banking the plane so another cousin, John May, could lean out and photograph our condor straight-on, while I held onto his belt as a safety measure. Because, as *Scientific American* ("Big" 1983) noted, our drawing was "remarkable in its exactness" to the original, I concluded that the Nasca probably used an even simpler version of this technique, with a significant amount of work being done freehand (Nickell 1983).

Twenty-four years later, in 2006, I was asked to come out of retirement and make another, this time for National Geographic Television's series *Is It Real?* The producers had chosen the giant spider, and, with only a couple of helpers, I drew it handily in one day, while they filmed the process from a cherry picker (figure 2).

Not long afterward—and very belatedly—I was able to fly over the original Nasca geoglyphs, accompanied by SKEPTICAL INQUIRER managing editor Benjamin Radford. We traveled by bus from Lima and commissioned one of the small, light airplanes that make regular flights over the area. We ignored a travel-guide warning to "avoid breakfast before flying" (Wehner and Gaudio 2004, 234), hoped the one-eyed man who picked us up at our hotel was not our pilot, and bravely faced evidence that our actual pilot had tanked up on *pisco* (white-grape brandy) before the flight. Even though during steep turns the pilot would turn around to chat with me in the back seat, there were no disasters.

The July 31 flight fulfilled one of my longstanding dreams, as we flew not only over the condor and spider—who now were like old friends to me—but also the monkey, whale, heron, and many other figures. (Later, I would myself celebrate with pisco—the pisco sour being Peru's national drink. I even learned to make the cocktail from our Lima hotel bartender, amusingly a Peter Lorre look-alike.)

Before leaving Nasca, we were also able to observe a few geoglyphs from an observation tower, walk a segment of one long line (otherwise walking on the markings is prohibited), and visit the Casa-Museo Maria Reiche. Named for the German mathematician who devoted her life to studying and preserving the lines, this is where she lived until her death in 1998 at age ninety-five. (When she died, Nasca town officials proclaimed a day of mourning, and German and Peruvian flags were lowered to half-staff. The Peruvian president called it "a really painful and sad loss for Peruvian archaeology." Just how painful a loss was underscored two months after Reiche's death, when American tourists drove their van across the arid plain, scarring the geoglyphs with tire tracks that, according to the Associated Press, "will remain for centuries" [Nickell 1998].)

Featured at the hacienda-turned-museum were Maria Reiche's simple room, her Nasca measuring and drawing instruments, aerial photos of the geoglyphs, and other related items. Outside were her VW van and—in a beautiful garden lined with multicolored

bougainvilleas—her grave.

Despite Maria Reiche's selfless work, many mysteries remain, notably that of why the geoglyphs were made. In his admirable book, *Nasca: Eighth Wonder of the World?*, anthropologist and astronomy professor Anthony Aveni reported the results of extensive studies of the Nasca lines. The studies fail to substantiate any astronomical significance, but the lines so correlate with geographic features as to suggest that they were used as mystical walking paths—"labyrinths"—during irrigation rituals (Aveni 2000, 212–222).

Inspired by this possibility, I took a new look at the drawings, observing several strongly suggestive elements. Not only do the figures look like paths (being cleared of gravel) and often have decidedly *winding* elements (e.g., the monkey's spiral tail and a bird's sinuous neck), but there are two features that offer further evidence of their purpose. First, unlike ordinary Nasca depictions (as on pottery), the figures are drawn with a continuous line. Second, they typically have an extraneous pair of lines (such as extend from the spider's lower right leg [again see figure 1]). Significantly, *if one walks into one of these lines, he or she is led to traverse the entire figure and exit from the other line*—seeming to confirm that the geoglyphs were indeed ceremonial paths (Nickell 2004).

This recognition takes us a step further in attempting to understand the legacy of the still mysterious Nasca people.

Figure 3. Peruvian guide helps identify one of the stepped pyramids at Pachacamac. (Photo by Joe Nickell)

Oracle at Pachacamac

In the Lurín Valley, about thirty kilometers south of Lima, stands the sacred citadel of Pachacamac. An extensive archeological site, it is a complex of adobe-brick buildings and pyramids, spanning various ancient cultures. Pachacamac was the dominant pilgrimage center on Peru's central coast and "home to the most feared, and respected, oracle in the Andes" (Wehner and Gaudio 2004, 283).

On August 2, I commissioned a personal tour of the citadel, enlisting a driver and professional guide. Like countless pilgrims of the Wari-Ishmay and later Inca cultures, I walked the sandy streets, climbed the stepped pyramids, and gazed from the heights of Pachacamac (figure 3). Albeit for different reasons, I too was in quest of the mysterious oracle.

At this Andean citadel, the god Pachacamac—whose name in the Incan language, Quechua, means "Lord of the World"—reigned supreme. According to native mythology, Pachacamac, the Creator, took as his wife Urpiwachak, who was goddess of fish and birds. (A pyramid temple with her name stands in the northwest part of the city near a now-dry lagoon.) Among Pachacamac's countless roles were protector of food, controller of earthquakes, and healer of diseases (*Pachakamaq* n.d., 35).

Few details are known about the oracle, but one naturally thinks of Ancient Greece's Oracle of Delphi. There, worshipers believed, the Pythian priestesses channeled the god Apollo after inhaling the fumes and drinking the waters of a bubbling spring that ran beneath the temple. According to Owen S. Rachleff, in his *The Occult Conceit* (1971, 137):

> It is quite obvious that the Oracle was simply intoxicated by some form of narcotic that had been naturally or artificially dissolved in the waters of the spring. The pertinent factor, however, especially as it concerns modern precognition, is the subsequent interpretation given her ravings by the Delphic priests. Most often these interpretations were offerings of good advice on matters of war, marriage, finance, and the like. But when the priests were asked for specific predictions—the bane of all seers—they cloaked their reports in clever ambiguities that, coupled with the ambiguous condition of human life, served as an effective ploy. Thus the name of a king or prince babbled by the Oracle might mean prosperity or calamity for the kingdom or personal harm (or fortune) for the king. If the king was later involved in a crisis, either good or bad—as kings or rulers are wont to be—the priests could take credit for a significant prophecy; something, they would say, was in the air concerning their king.

The wooden idol of Pachacamac (now in the on-site museum but "probably a replica" [Wehner and Gaudio 2004, 283]) was carved with various figures and symbols representing "a cosmic vision of the Andean world" of the twelfth century (*Pachakamaq* n.d., 11). At the top of the long, cylindrical idol stands, Janus-like, a two-faced figure, apparently representing Pachacamac's oracular ability. This is evident in the deity's being able to see in opposite directions and so, symbolically, to divine the past and future. According to chroniclers, copies of the idol were placed in several different parts of the city (*Pachakamaq* n.d., 11).

As we now know, the oracle met its

Figure 4. Author examines infamous Ica stones. (Photo by Benjamin Radford)

match in the two-facedness of Francisco Pizarro (ca. 1471–1541). Searching for gold and other riches, Pizarro spent nearly two years traveling across South America's mountains and deserts to locate the heart of the great Inca Empire. The Inca king Atahualpa had received assurance from the oracle at Pachacamac that he would be victorious against the bearded white men who ventured into his land. He expected to sacrifice most to the sun god, keeping only a few as castrated servants, while capturing and breeding the Spaniards' remarkable horses.

Pizarro had ideas of his own. He sent a friendly invitation to Atahualpa to join him at Cajamarca, the Incan gold-production center, in mid-November 1523. Arriving early, Pizarro stationed his 170 men in three empty warehouses that flanked the main square. While Atahualpa arrived with 5,000 warriors, he was so confident of supremacy that they were ceremonially dressed and only lightly armed. The king was ostentatiously borne on a litter by eighty Inca officials.

Under Pizarro's direction, a Dominican friar approached Atahualpa and explained that he had come to spread the Catholic faith, offering the king a little breviary (a book of instructions for the recitation of Catholic daily services). Outraged at this presumption, Atahualpa flung the book to the ground, whereupon the conquistadors launched a surprise attack with trumpets blaring, cannon blazing, and armored men on horseback charging with swords and lances. The Incans panicked and fled but were slaughtered in great numbers while many others were suffocated in the crush of bodies.

Captured and imprisoned, Atahualpa bitterly complained of the Pachacamac oracle's false prediction that he would prevail over the Spaniards. He soon offered the Spaniards a king's ransom: in return for his freedom, he would fill a big room (almost 88 cubic meters) with gold and two more with silver. Pizarro agreed, and, as the sacred and other priceless items arrived, he had nine furnaces run continuously to convert them into bars—an estimated 13,420 pounds of 22-karat gold and 26,000 of good-quality silver.

Despite the ransom, a majority of the Spanish officers decided to execute Atahualpa anyway, fearing he was plotting against them. The king agreed to a last-minute baptism—apparently to avoid an infidel's fate of being burned at the stake—and was hanged (Wehner and Gaudio 2004, 283, 460). The oracle of Pachacamac had failed not only to see the ruler's defeat, but his death as well.

Now Pizarro was drawn to the citadel by Atahualpa's accounts of golden treasures there. He and a troop of his soldiers made a three-week ride to the site. Shoving the Incan priests aside, the conquistador strode to the top of the stepped pyramid where he found a building fashioned of cane and mud, its door adorned with gemstones. In its dark interior he found the roughly carved effigy of Pachacamac. As he wrote, "Seeing the filth and mockery of the idol, we went out to ask why they thought highly of something so dirty and ugly" (qtd. in Wehner and Gaudio 2004, 283).

Pizarro should have looked critically as his own situation. Living by the sword and failing to follow many of the commandments of his own professed faith, he quarreled with his officers over power, had one executed, and was in turn assassinated by that man's followers—a sordid episode in the sordid history of religious conquest.

Ica Stones

On the Pan American highway between Lima and Nasca lies Ica, a town in the desert of the same name that bears one of the world's greatest deposits of marine fossils. On the Plaza de Armas in Ica is found the Museo Cabrera which features thousands of enigmatic stones. They are covered with engraved drawings purportedly made by some astonishingly sophisticated ancient civilization (see figure 4).

Bearing depictions of ancient men using telescopes, performing heart surgery and brain transplants, piloting flying machines, hunting dinosaurs, riding on the backs of pterodactyls, and other fantastic scenes, the rocks began to appear in 1966. At that time, a Peruvian physician, Javier Cabrera Darques, was given a carved rock as a birthday gift. It depicted an extinct fish, but it was Cabrera who was hooked: he learned that locals could supply him with more fabulous stones and he began to purchase them.

Cabrera was told that the engraved stones were discovered in a cave, but its location was never revealed. Nevertheless, he came to believe the artifacts were made by an advanced race. Cabrera abandoned his Lima medical practice, created in Ica a Museo de Piedras Grabadas ("Museum

of Engraved Stones")—now the Museo Cabrera—and proceeded to stock it with as many as 15,000 stones before his death in 2002 (Polidoro 2002; Wehner and Gaudio 2004, 244; Carroll 2004, 43–44). Cabrera insisted that the rocks were volcanic andesite that, being too hard to carve with simple stone tools, indicated the drawings were made by an extraterrestrial race he called *Gliptolithic Man* (Ica stones 2006).

As it happens, a peasant named Basilio Uschuya who had been "discovering" Ica stones was arrested by Peruvian authorities following a 1996 BBC documentary on the carvings. Charged with selling archeological treasures, he admitted that the carvings were fakes that he and his wife had produced with a dentist's drill and antiqued by baking the stones in dung (Ica stones 2006).

Nevertheless, the stones are still heralded by "ancient-astronaut" advocates (*à la* Von Däniken), fundamentalist creationists (who believe that man and dinosaurs coexisted), and other fringe types, including the "mytho-historians" (who hold that ancient mythologies should be taken literally) (Carroll 2002).

The stones' defenders include "psychic" Sylvia Browne (2005, 116) whose spirit guide Francine tells her the stones "were indeed a record left behind by extraterrestrials who inhabited the area millions of years ago." Browne (2005, 114) insists, "German laboratories have authenticated that the carvings on the stones are indeed very ancient" and bear a "patina of oxidation over them" (2005, 114).

Benjamin Radford and I stopped in Ica on our way to Nasca. On Sunday, July 30, the Museo Cabrera being closed, we had our hotel manager call and offer a cash payment for a special showing. We were met at the museum by Emma Hernandez, who took us inside the stone-filled office and two storerooms and generously allowed us to photograph and inspect the vast collection of Ica stones. Sitting at Cabrera's desk, I used a 103 Bausch & Lomb illuminated loupe to examine the engraved lines.

Subsequently, we were directed to a store across the plaza where we were told we might be able to purchase Ica stones. The proprietor brought out several from under a counter for us to view, and I purchased one depicting a man riding a dinosaur that did not have the added coloration and allowed me to see the stone's original dark patina of age. (I was later able to examine this stone with a stereomicroscope and make some simple tests.) We were also able, on two occasions, to watch Ica-type stone sellers easily and quickly produce Nasca imagery with a simple engraving tool.

The Ica stones I examined were not physically remarkable. They are simply weathered stones that do have a patina of what is called "desert varnish," and this is merely incised to produce the drawings. By their being engraved rather than carved, the hardness of the rock itself is not an issue, despite the claims of some. Cabrera's stones have been given a coating of boot polish—as the museum readily acknowledges—applied to enhance the lines. While this obscures the natural oxidized coating, the salient point is that the patina is completely absent from the inscribed lines—revealing that the engravings are of relatively recent vintage.

A peasant named Basilio Uschuya who had been "discovering" Ica stones was arrested by Peruvian authorities. He admitted that the carvings were fakes that he and his wife had produced with a dentist's drill and antiqued by baking the stones in dung.

Acknowledgments

In addition to individuals already mentioned, I am grateful to those who made possible the second Ibero-American Conference on Critical Thinking. These include—of course—Paul Kurtz, Barry Karr, and dedicated CFI staffers. I also greatly appreciate the efforts of Manuel A. Paz y Miño of Peru for his assistance in many ways.

References

Aveni, Anthony F. 2000. *Nasca: Eighth Wonder of the World?* London: British Museum Press.

The big picture. 1983. Scientific American 248(6) (June): 84.

Browne, Sylvia. 2005. *Secrets & Mysteries of the World.* Carlsbad, California: Hay House.

Carroll, Robert Todd. 2002. The Ica stones in: *The Skeptic's Dictionary.* Available at http://skepdic.com/icastones.html.

———. 2004. Pranks, frauds and hoaxes from around the world. SKEPTICAL INQUIRER 28(4) (July/August): 41–46.

Ica stones. 2006. Wikipedia entry. Available at http://en.wikipedia.org/w/index.php?title=Ica_stones&printable=yes; accessed June 29.

Nickell, Joe. 1983. The Nazca drawings revisited: Creation of a full-sized duplicate. SKEPTICAL INQUIRER 7(3) (Spring): 36–44.

———. 1998. Maria Reiche, Nazca lines' guardian, dies. SKEPTICAL INQUIRER 22(6) (November/December): 16.

———. 2004. Nasca: "laberintos en el desierto." *Pensar* 1(3) (July–September): 17–20.

———. 2007. *Relics of the Christ.* Lexington, Ky.: University Press of Kentucky.

Pachakamaq: Ciudad sagrada. N.d. An archaeological guide sold on site. N.p.: n.p.

Polidoro, Massimo. 2002. Ica stones: Yabba-Dabba-Do! SKEPTICAL INQUIRER 26(5) (September/October): 24–25.

Rachleff, Owen St. 1971. *The Occult Conceit: A New Look at Astrology, Witchcraft & Sorcery.* Chicago: Cowles.

Von Däniken, Erich. 1970. *Chariots of the Gods?* New York: G.P. Putnam.

Wehner, Ross, and Renée Del Gaudio. 2004. *Moon Handbooks Peru.* Emeryville, Calif.: Avalon Travel Publishing.

Woodman, Jim. 1977. *Nazca: Journey to the Sun.* New York: Pocket Books. □

Is Dawkins Deluded?

When Scientists Talk about Religion

By some accounts, 2006 was the year atheists struck back. Three books in particular made headlines across the world: Sam Harris's *Letter to a Christian Nation*, Daniel C. Dennett's *Breaking the Spell: Religion as a Natural Phenomenon*, and Richard Dawkins's *The God Delusion*. Dawkins received an especially large share of criticism for stepping beyond the boundaries of science, with theologians and biologists alike telling him that he made fundamental mistakes in both theology and science. By and large, he did neither, but he can be criticized for a somewhat sloppy philosophy.

Let us start with the charges that Dawkins's view of theology is naïve and that his arguments do not take into account the sophistication that modern theology has reached. For example, Jim Holt, writing in *The New York Times* (October 22, 2006), says that Dawkins "dismisses the ontological argument [for the existence of God]" and yet "seems unaware that this argument . . . comes in sophisticated modern versions that are not all that easy to refute." Dawkins actually anticipated such criticism and rejects the very notion that theology is a field of expertise. On p. 56 of *The God Delusion*, he says, "[I] wonder in what possible sense theologians can be said to *have* a province [of expertise]" (emphasis in the original), and on the following page: "I have yet to see any good reason to suppose that theology . . . is a subject at all." Indeed, the reason why the ontological "argument" for the existence of God (which essentially says that God exists by definition, He being the most perfect thing imaginable, and perfection "obviously" entailing reality) is difficult to reject logically is because it is fundamentally nonsensical, similar to asking what the color of triangles is.

Similarly, Allen Orr (himself an evolutionary biologist) writes in *The New Yorker* (January 11, 2007) that "the most disappointing feature of *The God Delusion* is Dawkins's failure to engage religious thought in any serious way." Orr—who wouldn't dream of accusing astronomers of failing to engage astrologers seriously—chastises Dawkins for citing Douglas Adams (the author of *The Hitchhiker's Guide to the Galaxy*) and the "science popularizer" Carl Sagan (apparently, Orr is unaware that Sagan was a professional astronomer as well), rather than philosophers like William James and Ludwig Wittgenstein. But the real question is: did Wittgenstein and James say anything more meaningful about religion than Sagan and Adams? I doubt it, and so, obviously, does Dawkins.

The second charge, that Dawkins misapplies science itself in his criticism of religion, is closer to the truth, but not for the reasons some of his fellow scientists apparently believe. For example, on November 13, 2006, Dawkins debated fellow biologist (and Christian) Francis Collins—of human-genome-project fame. According to *Time* magazine, which sponsored the debate, Collins disagreed with Dawkins's position that the truth or lack thereof of the proposition "God exists" can be ascertained scientifically, because "God cannot be completely contained within nature, and therefore God's existence is outside of science's ability to really weigh in." What does "completely contained within nature" mean? Is God partially contained in it? Can science then say something about that part of God that is in fact contained within nature? And in what sense does nature "contain" things or, even better, *fail* to contain them? This is the same sort of sophistry that gives theology a richly deserved bad name.

Yet, Collins was onto something, albeit not for the reasons he thought. On the one hand, Dawkins is absolutely right when he says that any religion that makes specific claims about physical aspects of the world (and make no mistake about it, *all* of them do, in one form or another), then that religion is open to scientific inquiry. Moreover,

Massimo Pigliucci is a professor of evolutionary biology and philosophy at Stony Brook University, a fellow of the American Association for the Advancement of Science, and the author of Denying Evolution: Creationism, Scientism and the Nature of Science. *His essays can be found at www.rationallyspeaking.org.*

wherever such inquiry has actually been carried out, religion lost, often spectacularly. In that sense, then, there is no compatibility between science and religion (*pace* both Stephen Jay Gould and Pope John Paul II). Consequently, any believer whose faith depends on the truth of his religion's assertions about the physical world is out of luck.

But Dawkins is more ambitious than that, and that's where he falls short. On p. 31 of *The God Delusion*, he defines what the "God hypothesis" consists of: "There exists a super-human, supernatural intelligence who deliberately designed and created the universe and everything in it, including us." On p. 36, he specifies that "I am not attacking any particular version of God or gods. I am attacking God, all gods, anything and everything supernatural, wherever and whenever they have been or will be invented." It is this hubris that is Dawkins's downfall, because his science would have been sufficient for a devastating attack on the overwhelming majority of gods and, certainly, of those that matter (largely the Judeo-Christian-Muslim tradition). But, when he says, for example on p. 48, that the God hypothesis (as previously defined) "is a scientific question," he is wrong. It's a philosophical one.

The problem is that Dawkins, despite his alliance with Dan Dennett, is no fan of philosophy, repeatedly displaying the all-too-common attitude of intellectual smugness shared by other scientists, from fellow biologist E.O. Wilson to physicist Steven Weinberg. On p. 293 of the book, for example, Dawkins invents an imaginary moral philosopher in order to mock the whole idea that philosophy has something to contribute to our understanding of morality. Bad move, because it turns out that Dawkins's argument throughout *The God Delusion* is, in fact, a very compelling *philosophical* argument.

The "God hypothesis" is indeed unlikely to be correct, but this is not because science can refute such a vague hypothesis on empirical grounds. Rather, it is because one can build a compelling set of arguments—informed by science and thoroughly compatible with it—that to believe in *anything* despite the complete lack of evidence is, in fact, irrational. Being an a-theist is as reasonable as being an a-unicornist, but that ain't science; it's a good, old fashioned philosophical argument. □

POINT OF INQUIRY

WITH D.J. GROTHE

Where can you hear the leading voices of skepticism and science on a weekly basis? On POINT OF INQUIRY, the Center for Inquiry's podcast and radio show, which is now one of the most popular science programs online. Listen for free at www.pointofinquiry.org today!

Each week, *Point of Inquiry* brings you incisive interviews, features, and commentary, focusing on the three research areas of the Center for Inquiry: pseudoscience and the paranormal; alternative medicine; and religion, ethics, and society. In addition to new shows every Friday, the entire archive of past episodes can be accessed online at www.pointofinquiry.org.
Previous popular guests include:

RICHARD DAWKINS SAM HARRIS NEIL DEGRASSE TYSON ANN DRUYAN PAUL KURTZ EUGENIE SCOTT
DANIEL C. DENNETT BILL NYE JILL TARTER JAMES RANDI AND MANY MORE.

"I admire this show . . . *Point of Inquiry* is the kind of challenging, stimulating show that I would like to see imitated throughout the country." — Ann Druyan

"So many science-minded discussions with cool people! The mind thrills." — *Seed* magazine

"*Point of Inquiry* is such a wonderful show." — Richard Dawkins

"One of my favorite podcasts!" — Neil deGrasse Tyson

"If you've only time to try just one, try *Point of Inquiry*." — Bob Carroll, Skepdic.com

"I wish there were more shows like this; its really refreshing to have this kind of radio. . . ." — Daniel C. Dennett

www.pointofinquiry.org

The Quest for the 'Real' Robin Hood

Once upon a time, there lived in Sherwood Forest a wronged nobleman whose lands, home, and woman had been stolen and who had turned into an outlaw. Along with his Merry Men, Little John, Friar Tuck, Will Scarlet, and Much the Miller's son, the bandit was a master of the longbow and stole from the rich in order to give to the poor. With King Richard the Lionheart busy on the Crusades, the kingdom fell into the hands of his evil brother John and his dastardly henchman, the Sheriff of Nottingham. They kept prisoner Maid Marian, Robin's girl, and fleeced the ordinary folk with oppressive taxes. The outlaws fought the new regime and, when he returned from the Holy Land, Richard the Lionheart recognized them as true and loyal servants, forgave their supposed crimes, and restored them to their rightful social positions. A year later, however, nostalgia took over and the outlaws returned to Sherwood Forest. In the end, betrayed by his cousin, the prioress at Kirklees Priory, the leader of the outlaws was killed.

This bronze statue of Robin Hood stands on the grounds of Nottingham Castle.

The name of this man? Robyn Hode. That's right, Robin Hood, the legendary hero of English tradition, may very well have lived in reality, and his name may have been Robyn Hode. Yes, maybe.

Prince of Throatcutters

The origins of Robin's legend are particularly obscure. The oldest written references are very short. The earliest known one can be found in a long poem written in 1377 by William Langland, titled *Piers Plowman*. In it, one of the characters says: "I don't know the Lord's Prayer very well like the Priest sings it. But I do know the rhymes of Robin Hood." Not much, really. But it tells us that, in the fourteenth century, Robin's figure was already the subject of ballads.

In a manuscript circa 1410, and preserved in Lincoln Cathedral, an anonymous clerk wrote a piece of doggerel stating that "Robin Hood in Sherwood stood." It was a common phrase, and its meaning was obvious. Again, not much, but it specifies where Robin Hood's adventures took place: Sherwood Forest.

There are many other fragmentary references that give the idea how, by the end of the Middle Ages, Robin Hood was generally recognized as synonymous with "gentleman outlaw." However, the first known complete tale dates from 1510 and is titled *A Gest of Robyn Hode*.

The problem in searching for the true Robin Hood is that few people take the trouble to really study what the *Gest* says. If they did, they would discover, for example, that Robin did not operate in Sherwood, but in Yorkshire; that Maid Marion and Friar Tuck were characters who were added much later; that the only king referred to was named Edward, not Richard; that Robin was not a wronged nobleman but a man of the people; and that he was much more violent than what is usually told. His conflict with the Sheriff of Nottingham ends with Robin cutting off the villain's head with a sword.

The fairy-tale Robin Hood, the one embraced by Hollywood, takes shape in 1598, when a contemporary of Shakespeare, Anthony Munday, produces a play based on the already popular Robin Hood stories. It was Munday who gave an aristocratic background to the hero in order to make him more appealing, not just to the groundlings but to the folk in the posh seats, too. And it was Munday who invented the fable that Robin Hood robbed from the rich and gave to the poor.

Lots of Robins

It was archivist Joseph Hunter, however, who first believed, in 1838, that he had finally discovered Robin Hood's true identity. He located a Robyn Hode, who was a servant to King Edward II in Nottingham in 1324.

Massimo Polidoro is an investigator of the paranormal, author, lecturer, and co-founder and head of CICAP, the Italian skeptics group. His Web site is www.massimo polidoro.com.

The only problem is that this Robyn does not appear to have been an outlaw.

Other historians, however, believe that Robin Hood's tales should be set in a previous age, considering that his legend seems to have been alive already in 1200. A plausible candidate, discovered by L.V.D. Owen in 1936, is a "Robert Hod, fugitive," mentioned in the Yorkshire assize roles for 1225–1226. The same outlaw turns up in entries for later years, once under the nickname "Hobbehod." As historian J.C. Holt, a professor of medieval history at Cambridge, states: "This is the only possible original Robin Hood so far discovered, the only one that we know was an outlaw."

Not everyone agrees, however. There are still those who consider valid the work of William Stukeley, a famous, eighteenth-century antiquarian, who believed that Robin Hood was truly a nobleman, the Earl of Huntingdon, who died in 1247. Stukeley combed through old family records, changed a name here, forged a whole family there, and "discovered" the quite fictitious Robert Fitz Ooth, Norman lord of Kime and pretended earl of Huntingdon. This fictional Fitz Ooth's background was used by many later writers.

Considering these many difficulties, Holt is more than justified when he sums up the quest with these words: "The answer to the question: 'Who was Robin Hood?' can only be 'There was more than one.'"

Searching for Proof

If it is not easy to identify a single person corresponding to the legendary Robin Hood, it may be easier to look for the historical places connected to him and see if they can confirm the legend. That's exactly what I set out to do, on a tour of England a couple of years ago, for a television documentary.

The Well: In a document dated 1422, for example, there is a mention of a "Robin Hood Stone" (equated by historians with the Skelbrooke site, on the Great North Road, known as Robin Hood's Well). The Well has been a tourist attraction for at least four centuries; travellers used to stop by and, for the price of one penny, sit on a chair and be admitted to the symbolic brotherhood of Robin's band. In the eighteenth century, the site was already well known, and architect John Vanbrugh designed a cover for the well, an arched stone shelter about three meters high. Today, the relic has been moved from its original site to accomodate the building of a dual carriageway and sits at the southern end of a lay-by and weigh station. This is nothing more than a minor neoclassical *oevre* by Vanbrugh that adds nothing to the knowledge of the real Robin.

The famous Major Oak still stands in Sherwood Forest.

Major Oak: Sherwood Forest houses a six-hundred-year-old oak, known as Major Oak, that is believed to have been the meeting place of Robin Hood's band. Today, however, we know that Robin was not from Sherwood but operated in Yorkshire. Furthermore, we can be pretty sure that the oak has nothing to do with him if the stories are set in 1200. The oak was still waiting to take root at the time.

The Priory: In Kirklees, there still exists the ancient priory where Robin supposedly died. According to the Gest, Robin, on his deathbed, shot an arrow through the open window and asked to be buried where it fell.

The Tomb: Approximately 550 meters away from that window (not bad for a dying man!), there actually is an ancient tomb. On it, there is an inscription saying that Robin Hood was buried there on December 21, 1247. "In reality, the inscription is from the eighteenth century," says David Hepworth, an expert on Robin and the owner of the land where the priory and the tomb stand. "It's a pseudo-local dialect cum Middle English red herring. But all editions of the *Gest* published before 1539 all say the grave was here. Henry VIII's court antiquary saw it, and we know from correspondence that the original tomb existed in the late sixteenth century—and we also know that eighteenth-century excavations to a depth of a meter found nothing. It's one of the earliest Robin tourist attractions. The old road used to pass close by, and we know tourists used to chip off bits of stone from the tomb as souvenirs, because records tell us the fence was rebuilt to prevent this. I think it may have been exactly that: a destination and talking point for an after-dinner stroll with guests, but we really don't know for sure."

And we probably will never know. The elusive outlaw still escapes those who try to catch him, and this may very well be the secret of his immortality. Robin Hood will forever be a mystery that can't be solved and, just because of this, will keep on fascinating those who

First They Came for Darwin, Then They Came for Copernicus and Galileo . . . .

A recent mass mailing was sent to thousands of addresses in Southern California (and who knows where else) asking, "Have Scientists Been Wrong for 400 Years?" Two free books in one, *A Geocentricity Primer* and *The Geocentric Bible 3*, published by the Geocentric Bible Foundation, Inc., of Hugoton, Kansas, promise to reveal "what scientists haven't been telling you for four centuries." For example, "astronomers have deliberately ignored fundamental experimental results of the 1870s and 1880s that showed the earth to be standing still." (Actually, a physicist named Einstein used those results to develop something called *relativity*.) "*All phenomena*—including the stationary satellite thousands of miles above the earth—are better explained by geocentricity."

Actually, the biblically based lobby for geocentricity is not new. The Tychonian Society was founded in 1971, vigorously defending, in its *Bulletin of the Tychonian Society*, the idea of a stationary Earth. What's new is the Association for Biblical Astronomy and its mass-mailing outreach, perhaps emboldened by the success of intelligent design in muddying science education with religion. Also new is the use of the Web to promote their essentially medieval worldview: see http://tinyurl.com/yu6uxp and www.geocentricbible.com. Summarizing their beliefs, the organization proclaims: "We believe that the creation was completed in six twenty-four hour days and that the world is not older than about six thousand years. We maintain that the Bible teaches us of an earth that neither rotates daily nor revolves yearly about the sun; that it is at rest with respect to the throne of him who called it into existence; and that hence it is absolutely at rest in the universe." The key idea motivating the group is stated quite succinctly: "the only absolutely trustworthy information about the origin and purpose of all that exists and happens is given by God, our Creator and Redeemer, in his infallible, preserved word, the Holy Bible. All scientific endeavor which does not accept this revelation from on high without any reservations, literary, philosophical or whatever, we reject as already condemned in its unfounded first assumptions."

In *A Geocentricity Primer*, author Gerardus D. Bouw scrutinizes Psalm 93:1:

> . . . *the world also is stablished, that it cannot be moved.* The word "stablished" may sound strange to the modern ear, but it communicates a very subtle point which, though present in the Hebrew, is lacking in all modern versions which favor the word "establish," instead. Stablish means to stabilize; establish means to set up. The rendering in the King James Bible reflects God's continuing, stabilizing influence on this present world. This makes a lot of sense considering that the world is founded on waters. . . . Since Psalm 93:1 indicates that the world cannot be moved, it would follow that it is not now moving.

Other geocentric passages cited by Bouw include Psalm 96:10, "the world also shall be established that it shall not be moved," and Psalm 104:5, which states that God "laid the foundations of the earth, that it should not be removed for ever." Ultimately, he concludes "the earth is not moving; it has a place of its own. But at the great white throne judgment, the earth will be removed; it will flee away and move for the first time in its history."

One might raise myriad objections to the ancient, Ptolemaic, Earth-centered system, but the biblical astronomers are sophisticated debaters and so have opted for the "modified Tychonic system," named for the noted sixteenth-century Danish astronomer Tycho Brahe:

> The model explains all observed phenomena. The sun is at the center of the circle representing the starry realm or the firmament. The shell [is] stylized, being actually billions of light years thick in the model. Irregularities in the distribution of stars in the firmament causes a one-year vibration of the entire universe so that the sun follows the circle running through it and centered on the earth. The planets orbit the sun, and the sun sees the earth as if it orbited it.

It's a well-crafted compromise between heliocentrism and the strict Earth-centered geocentrism of antiquity and seems to almost makes sense, except for the utter lack of any possible natural mechanism that could possibly account for the bizarre and capricious motions of not just the sun but the entire universe, motions whose sole purpose seems to be to *mimic* the appearance of a moving Earth. I said "the entire universe" to indicate the depth of the problem that twenty-first-century geocentrists face. Every star we can see, whatever its line-of-sight

Robert Sheaffer's World Wide Web page for UFOs and other skeptical subjects is at www.debunker.com.

velocity toward or away from us, when observed spectroscopically, sometimes has that velocity increased by what heliocentrists calculate as Earth's orbital velocity about the sun, and, six months later, it is decreased by precisely the same amount. No problem, says the heliocentrist—it's caused by the orbital motion of Earth. The geocentrist, however, must argue that *all* of the stars are moving to create this effect—and not just stars but whole galaxies. The entire Virgo Supercluster, 200 million light-years across, behaves as if its galaxies were attached to our sun by invisible glass rods, dutifully approaching earth, then receding, as that star makes its yearly circuit around the stationary Earth, dragging the entire observable universe with it.

Then there is that pesky matter of the apparent daily rotation of the entire sky that heliocentrist astronomers attribute to Earth's rotation. For biblical geocentrists, the apparent rotation of everything around stationary Earth is exactly what it seems to be. So that faint quasar we see that is fourteen billion light-years distant *really is* rotating around Earth each day. Taking 2ϖ times its distance, we see that the quasar is in fact moving almost eighty-eight billion light-years *every twenty-four hours* as it rotates around the stationary Earth at the phenomenal speed of approximately a gazillion times the speed of light. Einstein's universal speed limit of c is continually broken by the rotation of the universe itself, since even the nearest stars must move much faster than light to complete their circuit around the earth in just twenty-four hours.

A fundamentalist Catholic group, Catholic Apologetics International, is unrelated to the Association for Biblical Astronomy, but proclaims on its Web site, "*Galileo Was Wrong!*" (www.galileowaswrong.com): "The earth revolves around the sun? Think again! . . . Can You Handle the Truth?" A CD containing over a thousand pages of "scientific evidence for geocentrism" is available for just twenty-three dollars. You can also buy "Galileo was wrong" T-shirts and coffee mugs, the perfect thing to take to the next Science Fair.

* * *

In the world of UFO abductions, the Betty Andreasson case ranks among the most prominent and most esteemed, often discussed in the same reverenced tones as the case of "abduction" pioneers Betty and Barney Hill. Back in 1967, Betty Andreasson was allegedly abducted by alien beings that floated in through closed doors and placed all the members of her family in a trance. The leader of these creatures was named Quazgaa, and gave Betty a little book of cosmic knowledge, which unfortunately "disappeared." He assured her that the aliens, like Betty, were Christians and were expecting Jesus's return. Weird occurrences and further abductions continued to plague Betty and some of her family members for years. She was placed under hypnosis to "recover" the memory of what had supposedly happened to her aboard the craft, resulting in a large (if dubious) body of UFOlogical data. The best-known account of this abduction story is in the 1979 book *The Andreasson Affair* by Raymond E. Fowler.

Now Betty's stepson, Robert J. Luca, has published several long diatribes on the Internet, in which he calls the entire incident a "hoax" and says his father, Robert A. Luca—Betty's husband—is a "pathological liar" (see http://alienabductionaccounts.blogspot.com, search for "Andreasson"; also www.luca65.com/page2.html). Robert Jr. claims his father "bugged his own phone to trick investigators, and also made weird noises on the line as if a alien were on the line and all sorts of weird things. It made that much more material for Betty to write about." Supposedly, Robert Sr. used the phone taps to fool Fowler and other investigators. "As for Betty, she is so hung up on her weird religious beliefs, she actually thinks she is a moderns day prophet and that god is contacting her through the UFO's and warning the world through her. . . . [She] has drawn pictures and wrote about UFO's every week without fail since they have been married in the late 70's."

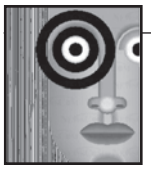
Robert J. Luca is not skeptical about UFOs in general and suggests that well-known cases such as the Roswell crash may well have validity. However, he charges, "These two people [Robert Sr. and Betty] have used the UFO society for years and only to gain book sales, money and own self-satisfaction of feeling as if they are in the public eye." *[Robert Jr.'s quotes are presented as they originally appeared on the Web site.—Eds.]*

On the other hand, another family member, Becky Andreasson (Betty's daughter), not only supports her mother's story completely but claims to share in her experiences (at www.beckyandreasson.com). Becky's Web site is filled with drawings of her extended encounters with UFO "Elders," Gray Watchers, a "floating blue ball," and a herd of mystical cats. As Becky's story illustrates, these days, one doesn't so much *sight* UFOs as *have a relationship* with them.

* * *

Finally, we cannot let this important anniversary pass unnoticed: June 24, 2007, marks the sixtieth birthday of the contemporary phenomenon of UFOs. It was on that date in 1947 that private pilot Kenneth Arnold reported seeing nine objects, allegedly flying at a high rate of speed, that "flew erratic, like a saucer if you skip it across the water." The anniversary is being marked with great festivities in Roswell, New Mexico, whose now-celebrated "UFO crash" started out as a momentary lapse of sober judgment in the immediate post-Arnold sighting frenzy and was justifiably forgotten for over thirty years (until dredged up and cleaned off by dedicated UFO enthusiasts). In the intervening sixty years, there have been many thousands of reported sightings of UFOs. However, in every single case, the alleged mysterious object managed to make its escape before the evidence of its existence became convincing.

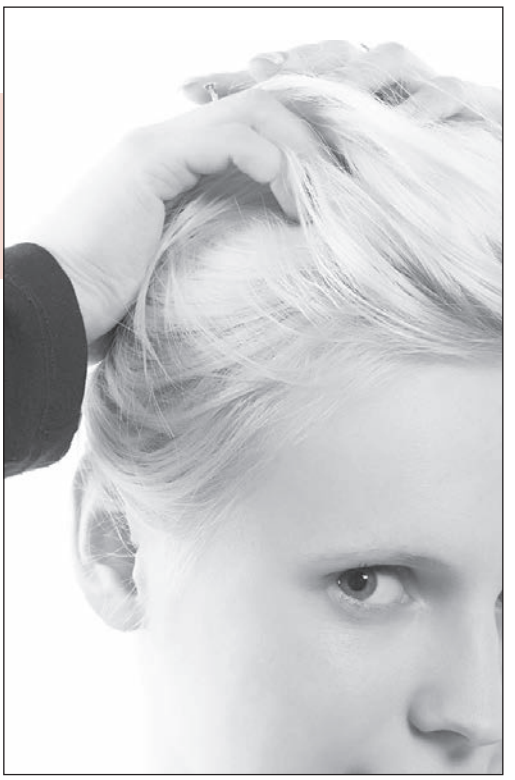
One recent victim of UFO frustration is the editor of *UFO* magazine, Donald Ecker, who just announced his retirement from what he calls "the UFO fog" after twenty years. Once known as a fierce bulldog among UFO proponents, Ecker writes, "Most 'researchers' are ignorant of what has happened previously in the field of UFO research. They are ignorant of the claims made in the past, ignorant of past hoaxes perpetrated by 'players' in the field and are intolerant of views that conflict with their deep seated erroneous beliefs. Quite frankly,



Might Fright Cause White?

Q: Can hair turn white overnight, from stress or from fright?

—A. Lefebvre



A: For centuries, it has been widely believed that fright can turn hair white. They say that the hair of condemned prisoners (such as Thomas More and Marie Antoinette) turned white the night before their executions. They say that many people who have terrifying experiences with ghosts find that their hair has turned white as snow. Of course, "they" say a lot of things.

The idea that psychological trauma leaves a physical mark is an ancient one. Hair turning white, especially from fright or an encounter with a ghost, is a staple in much folklore. It is, in fact, a well-known traditional international folk narrative motif (F1041.7 in the *Motif-Index of Folk-Literature: A Classification of Narrative Elements in Folktales, Ballads, Myths, Fables, Mediaeval Romances, Exempla, Fabliaux, Jest-Books, and Local Legends).* It is also featured prominently in many urban legends, described as the result of, for example, encounters with hook-handed serial killers freshly escaped from local insane asylums.

The idea is superficially believable, yet clearly rooted in myth and folklore. Is it true?

The story has less credibility than Uri Geller's press agent. It is medically impossible: there is no mechanism by which hair could organically and spontaneously turn white, either suddenly or overnight. Despite cosmetics companies' claims that their products can restore life and body to hair, hair is dead. The main shaft of the hair follicle is extruded, expired biomass no longer influenced by any psychological or physiological processes in the body.

Even if an illness, fright, or sudden shock could turn hair white, it would be weeks before the effect would be visible, because only the root would be affected. The same principle is involved when a fingernail is injured near the cuticle and the damaged part gradually grows out. It's no more possible for the whole hair shaft to spontaneously turn white than it is for a dead tree branch to sprout leaves.

This leads us to another interesting aspect of the transition from colored to gray to white hair. According to some experts, there is no such thing as gray hair; they don't exist. Hair can *appear* gray because individual white or colorless hairs are mixing with hairs that still have color. This is especially visible in "peppered" beards; the gray is a pointillistic illusion. Gray hair might appear to turn white if the colored hair shafts selectively died for some reason, leaving the white hairs behind. A small bottle of hair coloring can do something that neither impending execution nor ghosts can do. □

Benjamin Radford is a writer and investigator with the Commitee for Skeptical Inquiry; his Web site is at www.RadfordBooks.com.

Submissions can be sent to: **The Skeptical Inquiree, Skeptical Inquirer, P.O. Box 703, Amherst NY 14226-0703 (or bradford@centerforinquiry.net).**

THE SCIENCE BEHIND FICTION

Cinema Fiction vs. Physics Reality

Ghosts, Vampires, and Zombies

Two physicists examine certain features of popular myths regarding ghosts, vampires, and zombies as they appear in film and folklore.

COSTAS J. EFTHIMIOU and SOHANG GANDHI

For many people, ghosts, vampires, zombies, and the like are no more than Hollywood fantasy. However, these movies have increasingly come to reflect popularly held pseudoscientific beliefs. For instance, the 2005 movie *White Noise* is based on the new trend among paranormalists—Electronic Voice Phenomena (EVP). The occult underground in both America and Europe is witnessing a trendy rise in vampirism, and belief in voodoo zombiefication is widespread in many parts of South America and Africa. Furthermore, paranormal depictions in the media, especially television and Hollywood, have a definite influence on the way people think about paranormal claims(see, for example, Sparks 1998 and Sparks 2006).

In this article, we point out inconsistencies associated with the ghost, vampire, and zombie mythologies as portrayed in popular films and folklore and give practical explanations to some of their features. Of course, the paranormalist or occultist could claim that the Hollywood portrayal is a rather unsophisticated and inaccurate representation of their beliefs and thus the discussion we present is moot. However, if they are to change their definition each time we raise an issue, then all that they are really arguing is that there exists something out there that may be given the name "ghost," for instance. Surely, no skeptic could argue with this.

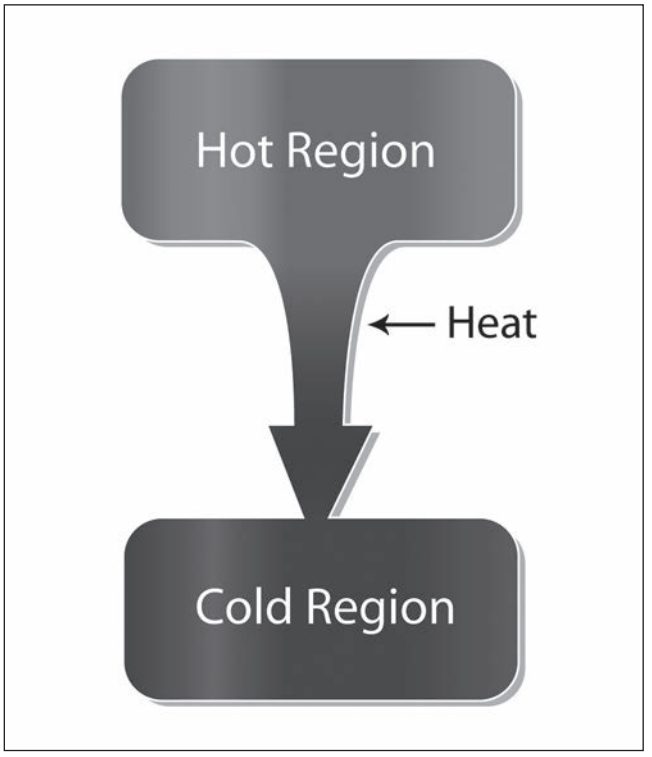


Figure 1. Heat always moves from a hotter object to a colder object.

Costas J. Efthimiou is a theoretical physicist at the University of Central Florida (UCF). He is the advisor to the local Campus Freethought Alliance (CFA) chapter, which he helped to establish at UCF. Address: Department of Physics, UCF, 4000 Central Florida Blvd., Orlando, FL 32816; e-mail: costas@physics.ucf.edu. Sohang Gandhi received his BS in physics with honors. Among his many awards, he has been a Goldwater scholar, an NSF fellow and was selected for the 2006 all-USA third team. He has served as the president of the CFA chapter at UCF. In fall 2006, he began his graduate studies in physics at Cornell University.

Ghosts

Sudden Cold

It has become a Hollywood cliché that the entrance of a ghostly presence is foreshadowed by a sudden and overwhelming chill (see, for example, *The Sixth Sense*). In fact, sharp temperature drops are very commonly reported in association with supposed real-life encounters with ghosts or poltergeists. This feature of supposed ghost sightings lends itself naturally to physical explanation.

The famous Haunted Gallery at Hampton Court Palace near London is reputedly stalked by the spirit of Catherine Howard, who was executed on February 13, 1542, by order of Henry VIII. Visitors to the room have described hearing screams and seeing apparitions in the gallery. A team of ghost-busting psychologists, led by Richard Wiseman[1] of Hertfordshire University, installed thermal cameras and air-movement detectors in the gallery. About 400 palace visitors were then quizzed on whether they could feel a "presence" in the gallery. More than half reported sudden drops in temperature, and some said they sensed a ghostly presence. Several people claimed to have seen Elizabethan figures.

Before moving on to an explanation, we will need to outline the concept of heat. When a "warm" object is placed next to a "cool" object (see Figure 1) energy will begin to flow from the warmer body (causing it to cool) to the cooler body (causing it to warm). This energy, which is being transferred between the two objects due to their difference in temperature, is called *heat*. Note that an object is never said to "possess" any amount of heat; heat is only defined through transfer. For instance, no matter how hot a stove, it never possesses any degree of heat. When someone suddenly touches the stove, however, there is heat—it is the energy flowing from the stove to that person's hand.

As heat continues to be transferred from the warmer body to the cooler one in figure 1, and the warmer body's temperature continues to drop while the cooler body's temperature climbs, there comes a point when the two bodies are at the same temperature. At this point, heat ceases to flow between the two objects, since neither is the hotter one and heat has no definite direction in which to be transferred. This condition is called *thermal equilibrium*.

In our stove example, heat was transferred via conduction—the exchange of heat through direct contact. There are other ways that heat can be transferred. These involve the exchange of heat by two objects separated by some distance. If these two objects are emersed in a fluid (Earth's atmosphere, for example), then the warmer body may provide heat to the fluid in its immediate vicinity. This warmer fluid will then tend to rise, thus coming in contact with a cooler body above. There may also be a lateral current in the fluid, thus allowing the heated fluid to affect a cooler body to the side. This type

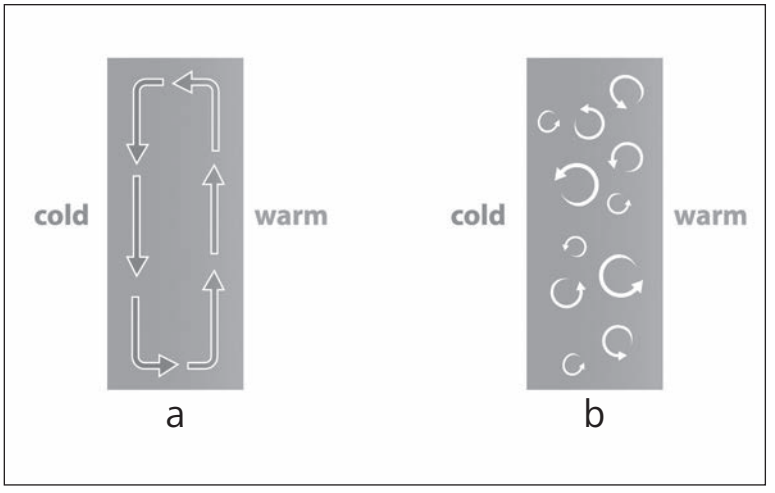


Figure 2. These diagrams show the motion of convection currents in a fluid.

of heat transfer, by an intermediary fluid, is called *convection*.

In figure 2a, we give a simplified example of what are known as *convection currents*. Suppose that the right wall is kept warm and the left wall is kept cool. Air in contact with the right wall will tend to gain heat and then rise, while air in contact with the left wall will tend to lose heat and then sink. The circular flow that forms is called a convection current. Air cycles around in a loop, picking up some heat at the right wall, dropping it off at the left wall, and then coming back around again. Actually, the air-current pattern will be somewhat more complicated than what we just described. There will be all kinds of smaller cycles and eddies embedded in complex patterns, as in figure 2b. The overall flow, however, will be as in figure 2a.

The third mode of heat transfer allows for exchange between two separated objects even if they are in a total vacuum. How can two objects exchange heat if there is no matter in between them? The answer is *radiation*. The thermal energy of a body is expressed in the "jiggling" of its various constituent particles. As electrically charged particles within a body jiggle about, they produce electromagnetic waves. When these waves hit another body, they cause the particles in that body to jiggle more than they were before, and the body heats up. Since hotter bodies produce more of this radiation, there will be more radiation from the hotter body falling upon the cooler body than from the cooler body falling upon the hotter body. Thus, overall, the hotter body will be losing heat while the cooler body will be gaining heat. We will not be too concerned with this particular mechanism for heat exchange in this article.

Returning to the Haunted Gallery at Hampton Court Palace, Richard Wiseman's team reported that the experiences could be simply explained by the gallery's numerous concealed doors. These elderly exits are drafty, and the combination of air currents they let in cause sudden changes in the room's temperature. In two particular spots, the temperature of the gallery plummeted by up to 2°C (3.6°F). "You do, literally, walk into a column of cold air sometimes," said Wiseman. "It's possible that people are misattributing normal phenomena . . . . If you suddenly feel cold, and you're in a haunted place, that might bring on a sense of fear and a more scary experience." Thus, the rumor that "cold spots" are associated with ghosts seems to be a myth created by the construction of old buildings and vivid imaginations.

But how could a few degrees drop in temperature explain the dramatic chills described in so many ghostly accounts? First off, what we sense as cold is not correlated to temperature so much as to the rate at which heat is being transferred from our bodies to the environment. For instance, even in a temperate pool, one feels a very sharp chill when one first enters. A moderate draft containing condensed moisture could cause a very sharp sensation of cold. Second, we are all aware of the "tall-tale" effect. Memories tend to become distorted and exaggerated. It is exactly this reason why scientists tend not to rely on unchecked eyewitness accounts.

The Inconsistency of the Notion of Immaterialness

Figure 3. These two stills are taken from the movie *Ghost*. In the left still, the ghost goes through a door. In the right still, the ghost, who follows a burglar in his girlfriend's home, loses his balance as he ascends the staircase and falls on—not through—the stairs.

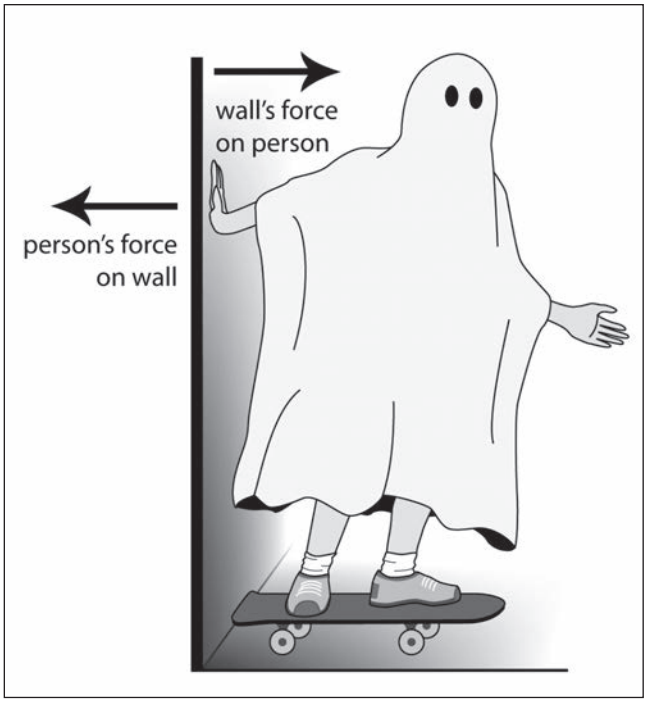


Figure 4. Newton's third law, known as the action-reaction law, is demonstrated here.

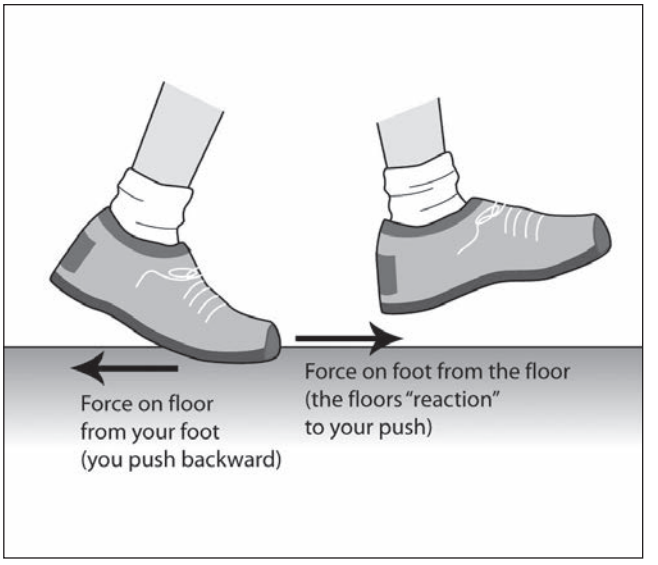


Figure 5. Multiple forces act on the feet of a person while walking.

Popular myth holds that ghosts are immaterial. For instance, in the movie *Ghost*, the recently deceased main character tries desperately to save his former lover from a violent intruder. His attempts to intervene grant him no avail, as, at each lunge, he passes right through the perpetrator. It is interesting, however, that he was able to walk up the stairs at the same time. In fact, this is a common feature of the ghost myth. Ghosts are held to be able to walk about as they please, but they pass through walls and any attempt to pick up an object or affect their environment proves fruitless unless they are poltergeists, of course!

Walking requires an interaction with the floor, and such interactions are governed by Newton's Laws of Motion. Newton's first law is the law of inertia. It states that a body at rest will remain at rest until acted upon by an external force.

Therefore, a person cannot start walking unless a force, applied by some body other than herself, is acting upon her. But where is the force coming from? The only object in contact with the person while walking is the floor. So, the force moving a person while walking is coming from the floor. But how does the floor know to exert a force when the person wants to start walking and stop exerting it when the person wants to stand? Actually, there is no magic here. The person actually "tells" the floor using Newton's third law.

Newton's third law says that if one object exerts a force on another object, then the second object exerts a force that is equal but oppositely directed, on the first object—hence "for each action there is an equal but opposite reaction." Thus, when the skate-boarder in figure 4 pushes on the wall, the wall pushes right back on her, causing her to accelerate off to the left.

The mechanics of walking are shown in Figure 5: the person wanting to walk must remain at rest unless a force acts on her. She gets the floor to apply a force on her by applying an opposite force on the floor with her foot. She keeps repeating this action, alternating feet. The point is that, for the ghost to walk, it must be applying force to the floor. The floor is part of the physical universe, so, in order to walk, the ghost must have an affect on the physical universe. If this is so, then we can detect the ghost via physical observation. The depiction of ghosts walking contradicts the idea that ghosts are immaterial.

So which is it? Are ghosts material or immaterial? Maybe they are only material when it comes to walking. Well, then we must assume that they can't control this selective immaterialness, otherwise Patrick Swayze would have saved his girlfriend in *Ghost*. In this case, we could place stress sensors on the floor to detect a ghost's presence. Maybe they walk by some other supernatural means. Well, why can't they use this power to manipulate objects when they want to? Even more, it seems strange to have a supernatural power that only allows you to get around by mimicking human ambulation. This is a very slow and awkward way of moving about in the scheme of things. In any case, you'd have to go to some lengths to make this whole thing consistent.

Incidentally, the reader may have noticed that we skipped a law in our discussion. We discussed the first and third of Newton's laws. Newton's second law of motion states that the acceleration of an object—the rate at which it speeds up—is proportional to the net force applied, the constant of proportionality being the mass. We didn't need the precise statement of this law but, silently, we did use it. The second law implies that the acceleration of an object will be nonzero (and thus the object will be able to change its state of motion) only if a net force is acting on it. This was exactly our statement: "Therefore, a person cannot start walking unless a force, applied by some body other than herself, is acting upon her."

Vampires

Anyone who has seen *John Carpenter's Vampires*, *Dracula*, *Blade*, or any other vampire film is already quite familiar with the vampire legend. The vampire needs to feed on human blood. After one has stuck his fangs into your neck and sucked

you dry, you turn into a vampire yourself and carry on the blood-sucking legacy. The fact of the matter is, if vampires truly feed with even a tiny fraction of the frequency that they are depicted as doing in the movies and folklore, then humanity would have been wiped out quite quickly after the first vampire appeared.

Let us assume that a vampire need feed only once a month. This is certainly a highly conservative assumption, given any Hollywood vampire film. Now, two things happen when a vampire feeds. The human population decreases by one and the vampire population increases by one. Let us suppose that the first vampire appeared in 1600 C.E. It doesn't really matter what date we choose for the first vampire to appear; it has little bearing on our argument. We list a government Web site in the references (U.S. Census) that provides an estimate of the world population for any given date. For January 1, 1600, we will accept that the global population was 536,870,911.[2] In our argument, we had at the same time one vampire.

We will ignore the human mortality and birth rate for the time being and only concentrate on the effects of vampire feeding. On February 1, 1600, one human will have died and a new vampire will have been born. This gives two vampires and 536,870,911–1 humans. The next month, there are two vampires feeding, thus two humans die and two new vampires are born. This gives four vampires and 536,870,911–3 humans. Now on April 1, 1600, there are four vampires feeding and thus we have four human deaths and four new vampires being born. This gives us eight vampires and 536,870,911–7 humans.

By now, the reader has probably caught on to the progression. Each month, the number of vampires doubles, so that, after n months have passed, there are

$$\underbrace{2\cdot 2\cdot 2\cdot \ldots \cdot 2}_{n \text{ times}}=2^n$$

vampires. This sort of progression is known in mathematics as a *geometric progression*—more specifically, it is a geometric progression with ratio two, since we multiply by two at each step. A geometric progression increases at a tremendous rate, a fact that will become clear shortly. Now, all but one of these vampires were once human, so that the human population is its original population minus the number of vampires excluding the original one. So after n months have passed, there are

$$536{,}870{,}911-2^n+1$$

humans. The vampire population increases geometrically and the human population decreases geometrically.

Table 1 lists the vampire and human population at the beginning of each month over a twenty-nine-month period. Note that by the thirtieth month the table lists a human population of zero. We conclude that if the first vampire appeared on January 1, 1600, humanity would have been wiped out by June of 1602, two and a half years later.

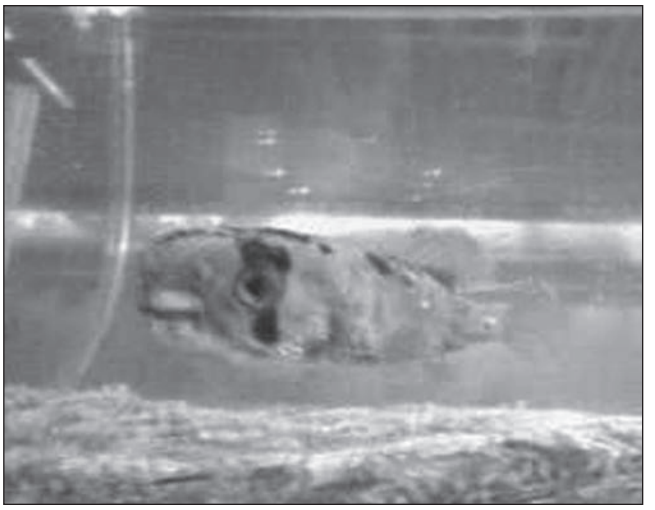
All this may seem artificial, since we ignored other effects on the human population. Mortality due to factors other then vampires would only make the decline in humans more rapid and therefore strengthen our conclusion. The only thing that can weaken our conclusion is the human birthrate. Note that our vampires have gone from one to 536,870,912 in two and a half years. To keep up, the human population would have had to increase by the same amount. The Web site (U.S. Census) mentioned earlier also provides estimated birth rates for any given time. If you go to it, you will notice that the human birthrate never approaches anything near such a tremendous value. In fact, in the long run, for humans to survive in the given scenario, our population would have to *at least* double each month! This is clearly far beyond the human capacity for reproduction.

If we factor in the human birthrate into our discussion, we find that, after a few months, the human birthrate is very small compared to the number of deaths due to vampires. This means that ignoring this factor has a negligibly small impact

Month	Vampire Population	Human Population
1	1	536870911
2	2	536870910
3	4	536870908
4	8	536870904
5	16	536870896
6	32	536870880
7	64	536870848
8	128	536870784
9	256	536870656
10	512	536870400
11	1024	536869888
12	2048	536868864
13	4096	536866816
14	8192	536862720
15	16384	536854528
16	32768	536838144
17	65536	536805376
18	131072	536739840
19	262144	536608768
20	524288	536346624
21	1048576	535822336
22	2097152	534773760
23	4194304	532676608
24	8388608	528482304
25	16777216	520093696
26	33554432	503316480
27	67108864	469762048
28	134217728	402653184
29	268435456	268435456
30	536870912	0

Table 1. Vampire and human populations at the beginning of each month during a 29-month period

Wilfred Doricent, the zombie, is shown in Haiti with his parents.



Puffer fish such as this one are the source of a highly potent neurotoxin.

on our conclusion. In our example, the death of humanity would be prolonged by only one month.

We conclude that vampires cannot exist, since their existence would contradict the existence of human beings. Incidently, the logical proof that we just presented is of a type known as *reductio ad absurdum*, that is, "reduction to the absurd." Another philosophical principle related to our argument is the truism given the elaborate title, the *anthropic principle*. This states that if something is necessary for human existence then it must be true since we do exist. In the present case, the nonexistence of vampires is necessary for human existence. Apparently, whoever devised the vampire legend had failed his college algebra and philosophy courses.

Zombies

The zombie legends portrayed in movies such as *Dawn of the Dead* or *28 Days Later* follow a similar pattern to the vampire legends. Once you are bitten by zombies, while you may manage to escape immediate death, you will eventually die and turn into a zombie, yourself. Thus, this particular type of zombie legend suffers the same flaw that we previously pointed out for the vampire legend. We still have some more work to do, however. There exists a second sort of zombie legend that pops its head up throughout the western hemisphere—the legend of "voodoo zombiefication." This myth is somewhat different from the one just described, in that zombies do not multiply by feeding on humans but come about by a voodoo hex being placed by a sorcerer on one of his enemies. The myth presents an additional problem for us: one can witness for himself very convincing examples of zombiefication by traveling to Haiti or any number of other regions in the world where voodoo is practiced.

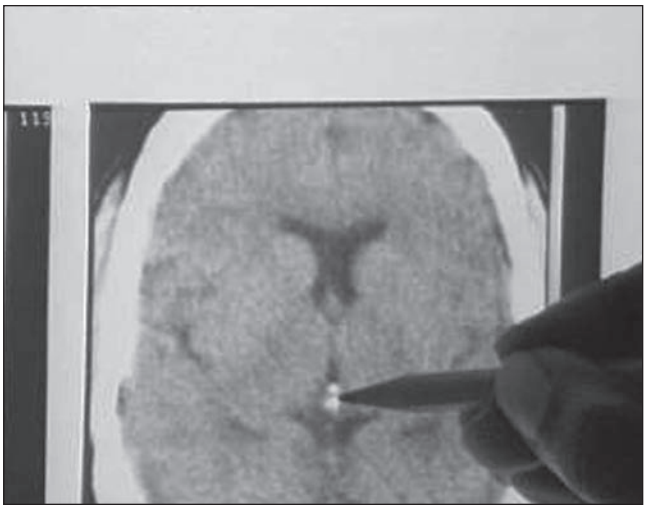
We describe the particular case of Wilfred Doricent,[3] an adolescent schoolboy from a small village in Haiti. One day, Wilfred became terribly ill. He experienced dramatic convulsions, his body had swelled tremendously, and his eyes had turned yellow. Eight days later, Wilfred appeared to have died. This was confirmed by not only the family and family friends present but also by the local medical doctor who could detect no vital signs. Wilfred's body appeared to show bloating due to *rigor mortis* and gave off the foul stench of death and rot. He was buried soon thereafter.

Some time afterward, the weekly village cockfight was interrupted as an incognizant figure appeared. The villagers were shocked as they gazed upon the exact likeness of Wilfred. The person was indeed Wilfred, as his family verified by noting scars from old injuries and other such details. Wilfred, however, had lost his memory and was unable to speak or comprehend anything that was said to him. His family had to keep him in shackles so that he wouldn't harm himself in his incoherent state. It appeared that Wilfred's body had risen from death, leaving his soul in the possession of some voodoo sorcerer. Word of Wilfred's "zombiefication" spread quickly throughout the village. It was believed that Wilfred's uncle, a highly feared voodoo sorcerer who had been engaged in a dispute over land with Wilfred's family, was the culprit. Wilfred's uncle was later charged with zombiefication, a crime in Haiti equivalent to murder.

Is this truly a case of supernatural magic? To answer this question, we turn our attention to a highly toxic substance called tetrodotoxin (TTX). In an article in *New Scientist* (2001), Bryan Furlow gives an overview of TTX's effects blended with a headlining news story:

> At first the U.S. federal officers thought they had stumbled upon a shipment of heroin. The suspicious package they intercepted last year [2000], en route from Japan to a private address in the US contained several vials packed with a white crystalline powder. But on-the-spot tests revealed that it was no narcotic. It took a while for forensic scientists at the Lawrence Livermore National Laboratory in California to identify a sample, and what they found was alarming. The powder turned out to be tetrodotoxin (TTX): one of the deadliest poisons on Earth.
>
> Gram for gram, TTX is 10,000 times more lethal than cyanide. . . . This neurotoxin has a terrifying modus operandi—25 minutes after exposure it begins to paralyze its victims, leaving the brain fully aware of what's happening. Death usually results, within hours, from suffocation or heart failure. There is no antidote. But if lucky patients can hang on for 24 hours, they usually recover without further complications. . . .
>
> The Livermore team estimated that to extract the 90 mil-

Frère Dodo, a former voodoo priest, confirms that the recipe used to make the drug for zombiefication includes a powder derived from the puffer fish.



A doctor points to lesions in the ventricular system of the right frontal cone in a brain scan of Wilfred Doricent.

> ligrams of TTX discovered by the Feds, you'd need between 45 and 90 kilograms of puffer-fish livers and ovaries—the animal's most deadly tissues. No one knows what use its intended recipient had in mind. . . .

TTX is found in various sea creatures and, in particular, in the puffer fish. Puffer fish are a delicacy in Japan known as *fugu* that only trained and licensed individuals prepare by carefully removing the viscera. Of course, despite the care taken in preparation, about 200 cases of puffer-fish poisoning are reported per year with a mortality rate of 50 percent. The symptoms of the poisoning are as follows (U.S. FDA):

> The first symptom of intoxication is a slight numbness of the lips and tongue, appearing between twenty minutes to three hours after eating poisonous puffer fish. The next symptom is increasing paraesthesia in the face and extremities, which may be followed by sensations of lightness or floating. Headache, epigastric pain, nausea, diarrhea, and/or vomiting may occur. Occasionally, some reeling or difficulty in walking may occur. The second stage of the intoxication is increasing paralysis. Many victims are unable to move; even sitting may be difficult. There is increasing respiratory distress. Speech is affected, and the victim usually exhibits dyspnea, cyanosis, and hypotension. Paralysis increases and convulsions, mental impairment, and cardiac arrhythmia may occur. The victim, although completely paralyzed, may be conscious and in some cases completely lucid until shortly before death. Death usually occurs within four to six hours, with a known range of about twenty minutes to eight hours.

Sometimes, however, a victim pronounced dead is lucky enough to wake up just before his funeral and report to his bewildered family that he was fully conscious and aware of his surroundings throughout the entire ordeal. Therefore, TTX has the unusual characteristic that, if a nonlethal dose is given, the brain will remain completely unaffected. If just the right dose is given, the toxin will mimic death in the victim, whose vitals will slow to an immeasurable state, and whose body will show signs of *rigor mortis* and even produce the odor of rot. Getting such a precise dose would be rare for a case of fugu poisoning, but can easily be caused deliberately by a voodoo sorcerer, say, who could slip the dose into someone's food or drink.

The secrets of zombiefication are closely guarded by voodoo sorcerers. However, Frère Dodo, a once highly feared voodoo sorcerer, who is now an evangelical preacher and firm denouncer of the voodoo faith, has revealed the process. It turns out that zombiefication is accomplished by slipping the victim a potion whose main ingredient is powder derived from the liver of a species of puffer fish native to Haitian waters.

This provides an explanation for how Wilfred could have been made to seem dead, even under the examination of a doctor. However, we have already said that the TTX paralysis was unlikely to have affected his brain. How does one account for Wilfred's comatose mental state? The answer is oxygen deprivation. Wilfred was buried in a coffin in which relatively little air could have been trapped. Wilfred's story probably goes something like this: slowly, the air in Wilfred's coffin began to run out so that, by the time he snapped out of his TTX-induced paralysis, he had already suffered some degree of brain damage. At that point, his survival instincts kicked in, and he managed to dig himself out of his grave—graves tend to be shallow in Haiti. He probably wandered around for some time before ending up back at the village. This topic was the subject of a horror film, *The Serpent and the Rainbow*.

Neuropsychiatrist Dr. Roger Mallory, of the Haitian Medical Society, conducted an MRI of zombiefied Wilfred's brain. He and his colleagues found lesions of the type normally associated with oxygen starvation. It would seem that zombiefication is nothing more then a skillful act of poisoning. The bodily functions of the poisoned person suspend so that he appears dead. After he is buried alive, lack of oxygen damages the brain. If the person is unburied before he really dies from suffocation, he will appear as a soulless creature ("zombie"), as he has lost what makes him human: the thinking processes of the brain.

Conclusion

We have examined the science behind three of the most popular pseudoscientific beliefs encountered in Hollywood movies. We have shown two of them—the idea of ghosts and vampires—to be inconsistent and contradictory to simple facts. For the third—the idea of zombies—we have made no attempt to deny that it relies on real cases. However, we have reviewed evidence showing that the concept is a misrepresentation of simple criminal acts.

Popular belief in these myths is an indication of a lack of critical-thinking skills in our society. With simple arguments, one can easily discredit the validity of such claims. We thus finish with the following quote by Carl Sagan (Sagan 1979):

> Both Barnum and H.L. Mencken are said to have made the depressing observation that no one ever lost money by underestimating the intelligence of the American public. The remark has worldwide application. But the lack is not intelligence, which is in plentiful supply; rather, the scarce commodity is systematic training in critical thinking.

Notes

1. Details on his research may be found on Wiseman's Web site at www.richardwiseman.com.

2. It may seem odd to the reader that we have specified the population with so much precision—we have a number in the one hundred millions and have specified it all the way down to the "one's place" (. . . 911). We chose the particular value for convenience. The actual estimated population in the seventeenth century is 562±17 millions. Beyond mathematical simplification, our choice has little impact on the argument to follow. If we were to report any number in the range of possible values for the population in the year 1600, the end result of our calculations would be essentially the same.

3. We claim no major originality in the presentation of what follows—except in collecting the material from the sources and arranging it as seen. Doricent's case is nicely described in a documentary (Clark 2002). The relation between zombies and TTX was first noticed by the Harvard ethno-botanist Wade Davis in 1982.

References

BBC. 2001. Palace ghost laid to rest. *BBC News*. March 29. Available at http://news.bbc.co.uk/2/hi/uk/1249366.stm.

Clark, Arthur C. 2002. Zombies: The living dead? (from the *Arthur C. Clarke's Mysterious Universe* [DVD]). Richmond Hill, Ontario: American Home Treasures.

Furlow, Bryant. 2001 The freelance poisoner. *New Scientist*. 2274 (January 20): 10

Sagan, Carl. 1979. *Broca's Brain: Reflections on the Romance of Science*. New York: Ballantine Publishing Group: 58.

Sparks, Glenn G. 1998. Paranormal depictions in the media: How do they affect what people believe? SKEPTICAL INQUIRER. 22 (4) (July/August): 35.

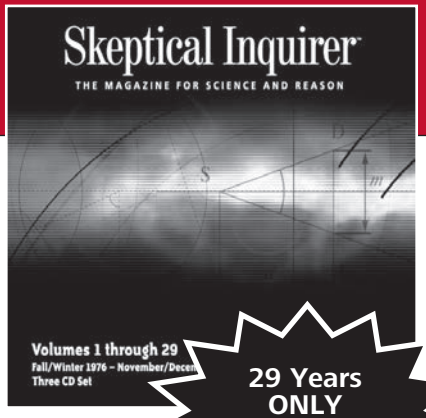
———. 2006. *Media Effects Research: A Basic Overview*, 2nd ed. Bemnont, Calif.: Thomson.

U.S. Census (United States Census Bureau). N.d. Available at: http://www.census.gov; accessed May 20, 2007.

U.S. FDA (United States Food and Drug Administration). 2006. Available at: http://vm.cfsan.fda.gov/%7Emow/chap39.html; accessed May 20, 2007. □

Skeptical Inquirer™

DVD or CD-ROM Series 1



29 Years
ONLY
$150.00

Volumes 1 through 29
(Fall/Winter 1976 – November/December 2005)

As the official publication of the Committee for Skeptical Inquiry, *Skeptical Inquirer* magazine has provided critical, science-based examinations of a wide variety of topics, from alternative medicine to zombies. This DVD or CD-ROM spans twenty-nine years of the magazine, from its origins as a bi-annual skeptics magazine (first called *The Zetetic*) to its modern incarnation as The Magazine for Science and Reason.

To order call toll-free
1-800-634-1610
Have your credit-card information available.

Superhero Science

BENJAMIN RADFORD

An Iceman exhibit at the Ontario Science Centre teaches visitors about heat transfer. Photos by Benjamin Radford.

Spasibo. It means thank you. I really know only a few words of the Russian language, but what little I do know I learned about twenty years ago. I was taught by a man named Piotr Rasputin. I didn't know him very well, and never asked if he was related to the czar's infamous "Mad Monk," but I do remember that he had the curious ability to turn his flesh into a sort of impervious living steel. Very cool, really.

One of my earliest geology lessons came when I was about ten years old. Like my smattering of Russian, it wasn't a full, formal lesson. But I did learn some interesting and scientifically sound facts, including that because limestone in the earth is partially water-soluble it often creates caves and sinkholes. I overheard a young duck without pants discussing this.

I don't recall if it was Huey, Dewey, or Louie, but, in any event, they were searching a cave for hidden treasure on behalf of their avaricious great uncle, Scrooge McDuck. (In the same comic I also learned that Scots are tight with a penny, but perhaps that was a stereotype I shouldn't have picked up.)

I learned scads of (mostly accurate) factoids from my youthful reading, following the adventures and exploits of Encyclopedia Brown, Tintin, Tom Swift, Doc Savage (and his band of scientists including a chemist and an electrical engineer), and, of course, comic-book superheroes.

The world of comics is not just for kids anymore, with complex storylines and very adult graphic novels. Comic-book heroes have jumped from colored splash panels to the big screen in blockbuster films such as *Batman*, *Superman*, *X-Men*, and, of course, the Spider-Man franchise (*Spider-Man 3* was recently released in theaters on May 4).

It's easy to forget that many of the superheroes who have repeatedly (albeit fictionally) saved the world are scientists: Spider-Man (Peter Parker) is an accomplished science student; the Incredible Hulk (in his human form, Bruce Banner) is a nuclear physicist; Mr. Fantastic (Reed Richards) holds doctorates in physics and electrical engineering; and so on. Most Marvel Comics superheroes have some strong link with science or technology (for example, Peter Parker invented his own web-slinging mechanism, and engineer Tony Stark created his own Iron Man exoskeleton). (For an in-depth look at science and superheroes, see *The Science of Superheroes*, by Lois Gresh and Robert Weinberg.)

Marvel Comics founder Stan Lee had created dozens of superheroes to populate his comic books, each with amazing and wondrous powers. He had heroes who could do amazing things rarely if ever seen in the real world. They could fly, walk through walls, teleport, turn invisible, and so on. But Lee had a problem: coming up with the powers was the easy part; coming up with a reason why they had those powers was tricky. So Lee—whose grasp of science is admittedly shaky—used science to ground and lend a sense of validity to the characters. Thus, many

Benjamin Radford is an avid supporter of science centers, even if he doesn't always understand all the principles he sees.

The X-Men exhibit discusses the science behind evolution and mutation.

Visitors to the Spider-Man swing can hang by a super-strong thread.

A couple watch themselves through a thermal imaging camera.

heroes gained their powers through scientific, naturalistic (if not wholly realistic) processes. The Fantastic Four were exposed to cosmic rays; Peter Parker was bitten by a radioactive spider; and so on.

This worked for a while, but, finally, Lee just got lazy. Once he read about the process of genetic mutation, that opened up a whole new world where mutations could be used as a blanket cause of myriad abilities ranging from psychic powers to teleportation to weather control. Thus, the X-Men were born.

Of course, the veneer of science only goes so deep; children wishing to climb walls and have superhuman Spider-Man strength can stop taunting their radioactive spiders. (And where do you get radioactive spiders, anyway?)

Part of the reason the comics had an educational element was that Stan Lee did not believe in talking down to his audience. He wrote his scripts and dialogue at a college level, unafraid of making his readers reach for a dictionary now and then.

Recently, Marvel Comics launched an educational science exhibit using many of its most popular comic-book superhero characters. The goal was to educate children and the public about scientific principles in a fun and interesting way. The exhibit introduces the public to many scientific topics and principles, including magnetism, engineering and hydraulics, acoustics and the physics of sound waves, chemistry, genetics and evolution, visual perception, and arachnology. Instead of dry display panels, the thirty action stations are geared toward hands-on demonstrations and learning. Among them:

• Doctor Octopus, a veteran Spider-Man foe who has four robotic tentacle-arms, serves to introduce a fascinating discussion of prosthetic limbs. Photos and artifacts illustrate the evolution of prosthetics from rudimentary hook hands to modern mechanical limbs.

• The Spider-Man display explains that the tensile strength of spider's silk is higher than any artificial material, and allows people to hang from hair-thin fibers, eight times stronger than steel.

• A station featuring Professor X, who trains his band of mutants to become crime-fighting X-Men, explores how mutations come about. Visitors are given three examples of living organisms, and then asked to guess the percentage of DNA that the three share.

• Daredevil, a blind superhero, is used as an example of how blind creatures can navigate using echolocation and acoustics.

Other superheroes who took time off from ridding the world of evildoers in order to educate kids for the exhibit include the Hulk, Iceman, Wolverine, the Human Torch, Storm, Banshee, and Iron Man. While some of the exhibits and displays are a bit silly (does matching the Hulk's angry facial expressions help us understand the physiology of anger?), overall, the exhibit is very well-designed, fun, and informative. Any exhibit that educates as it entertains is well worth a visit, and this is one of the best. Excelsior!

The Marvel Superheroes Science Exhibition premiered at the Ontario Science Centre in Toronto, Canada, and will be at the St. Louis (Missouri) Science Center from April 28, 2007, until September 4, 2007. For more information on the exhibit and tour schedule, see www.marvelscienceexhibition.com.

Global Climate Change Triggered by Global Warming

Part 2

This article is the second installment of our presentation of a position paper issued by the Center for Inquiry's new Office of Public Policy in Washington, D.C. The first installment appeared in our previous issue. The author is Stuart D. Jordan, a senior staff scientist (emeritus) with the NASA Goddard Space Flight Center. The entire text is available on the CFI/Washington, D.C. Web site at www.cfidc.org/opp/jordan.html. —Kendrick Frazier, Editor

STUART D. JORDAN

Since the case for natural forcing of the current rapid global temperature rise is weak, we must ask what human activities are likely to be major causes. Here a near consensus has arisen among most climatologists that human-rated greenhouse gases are the main culprit. While the scientific arguments supporting this position are now known to most knowledgeable people, it is useful to repeat them here in the interest of presenting a complete contemporary picture of global warming and climate change.

The Greenhouse Effect

There is complete agreement among research scientists whose work appears in the refereed literature that the "greenhouse effect" is a real physical process that is contributing to global warming.

There is complete agreement among research scientists whose work appears in the refereed literature that the "green-house effect" is a real physical process that is contributing to global warming. The greenhouse effect occurs because the sun's relatively short-wavelength radiation from the hot solar surface passes through Earth's atmosphere and reaches ground level to be absorbed by Earth, where the surface temperature is much lower than the sun's. Much of the longer-wavelength infrared radiation emitted by the cooler Earth is absorbed by Earth's atmosphere. Thus, a part of the sun's radiant energy is trapped by Earth's atmosphere. If the amount of incoming solar radiation that is absorbed and trapped exceeds the amount that is reflected and re-radiated into space, there is an imbalance, and Earth's temperature will begin to rise. The excess amount will warm the atmosphere until a higher equilibrium temperature is reached, at which the total rate of energy loss from Earth to space equals the amount that is retained by Earth.

Indeed, thanks to the greenhouse effect, our atmosphere has had equilibrium temperatures (within a limited range, determined by many different processes) sufficient to sustain, ultimately, human life. If Earth had no atmosphere, the mean global surface temperature would be approximately fifty degrees centigrade colder!

The problem of the current global warming occurs because of the aforementioned net imbalance in Earth's energy budget, with more solar energy being retained than is radiated back into space. This is due to the increase in greenhouse gases produced by human activity since the beginning of the Industrial Revolution, a process that continues today with an ever-increasing atmospheric concentration of the culprit gases (Prentice et al. 2001; Sarmiento and Gruber 2002). This situation makes global warming and some associated climate changes inevitable.

The Dominant Role of Carbon Dioxide Today

Greenhouse gases produce this imbalance when their concentration in the atmosphere is increased. The role of the most-offending greenhouse gas, carbon dioxide, will illustrate the process. Because carbon dioxide gas is a major by-product of burning the fossil fuels that power much of our industry and transportation, its production and release into the atmosphere continue to increase today. Carbon dioxide is an efficient absorber of the infrared radiation emitted by Earth, and increasing its concentration in our atmosphere increases the rate at which Earth's infrared radiation is trapped. Moreover, by warming the atmosphere above the previous equilibrium temperature, more water vapor is produced, which is the most effective greenhouse gas of all (Soden et al. 2005). The warming associated with these processes is further amplified by deforestation, which reduces the capacity of the land to absorb atmospheric carbon dioxide. Since the land is the only other major natural sink for this greenhouse gas, along with the oceans, deforestation contributes significantly to global warming (Sarmiento and Wofsy 1999).

Other warming processes are set in motion by those stimulated by an increased concentration of atmospheric carbon dioxide. Some of these could produce "runaway" phenomena until they go to completion. In the first part of this article, we cited the effect of reducing the bright reflecting ice cover in the Arctic, leading to greater absorption of solar radiation by the less reflecting water surface, thus inducing still more melting. In this case, the process could continue until the Arctic Ocean is entirely ice-free. Methane is an even more efficient greenhouse gas than carbon dioxide. Melting of the permafrost at high latitudes could release large quantities of methane into the atmosphere, and Arctic regions are warming most rapidly of all. While the consequences of methane release are still being debated in the scientific literature, this and other pro-

Stuart D. Jordan is a physicist and astrophysicist at NASA's Goddard Space Flight Center, where he has worked since 1968. His specialty is solar and stellar atmospheres, including, more recently, investigating the sun-climate connection. He is a Rhodes scholar and has published scores of papers in refereed scientific journals. Address: NASA/GSFC, Code 612.1, Solar Physics Branch, Greenbelt, MD 20771. E-mail: Stuart.D.Jordan @nasa.gov.

cesses triggered by continued global warming are now under investigation, as their cumulative effect could be extremely harmful (Prather et al. 2001).

Once carbon dioxide gas is released into our atmosphere, it stays there for well over a century. This means that even if we could freeze the release of these greenhouse gases at the current rate of production their concentration in our atmosphere will continue to increase for at least several decades. This fact, more than any other, may be the reason some climatologists are genuinely alarmed, especially in light of the rapid industrialization of China and India with their huge populations yearning for better lives, coupled with the apparent reluctance of some influential circles in our own country to take global warming and climate change seriously.

Finally, there is one more disturbing result emerging from research on carbon dioxide in the Earth's atmosphere. As its atmospheric concentration increases, so does its partial pressure over the oceans and the ability of the surface layers of the ocean to absorb it. Current research suggests that the oceans are already beginning to saturate in their ability to take up atmospheric carbon dioxide at the current rate (Sarmiento and Wofsy 1999). As noted above, these investigators have also shown that the oceans are one of the two most effective sinks for removing carbon dioxide from the atmosphere, along with bioprocesses on land.

Thus, from almost every point of view, the increasing atmospheric concentration of carbon dioxide is considered by most climatologists to be the greatest problem we face in addressing global warming and global climate change today.

The Reliability of Climate Models and Their Predictions

All major computer models that calculate a mean global surface temperature in response to the input of many physical processes agree on the importance of greenhouse gases, especially carbon dioxide, in driving global warming and climate change. However, since these models alone permit us to predict future climate change, we need to ask how reliable their predictions are. The best of these models, the GCMs (general circulation models), are still often criticized for many reasons, even with the advent of faster computers and a rapid growth of sophisticated modeling. Some of this criticism is undoubtedly justified, which is why this paper began by emphasizing that evidence for current global warming is based primarily on an enormous amount of hard data—carefully made observations taken over the entire globe—and not primarily on models (see Part 1, SI, May/June 2007). In addition, there may be no climate modeler anywhere today who would claim that there exists a current model that has a sufficiently fine grid to predict detailed local climate patterns over the globe as the climate changes.

However, some relatively recent problems with climate models have been at least partially solved, removing some of the most common criticisms. Several of the GCMs have now been refined to the point of replicating the past temperature history of Earth remarkably well, when their output is compared to either direct temperature measurements or reasonable proxies for estimating past climate conditions. An excellent review of climate models, as of the year 2000 C.E., is given in McAvaney et al. (2001) and was updated in the IPCC-2006 Science Report, issued since I wrote this article.

One of the problems that current research is beginning to address is the influence of aerosols on how much global warming occurs. The IPCC-2001 Science Report (Penner et al. 2001; Ramaswamy et al. 2001) discusses aerosols extensively and notes that their role in global warming—outside of the tropospheric cooling effect of large volcanic eruptions—is much less understood than that of greenhouse gases. This becomes significant when we consider that recent research suggests a larger role for aerosols in general and that this role is likely to contribute to a net *cooling* (Bréon 2006). During the middle of the twentieth century, the mean global surface temperature failed to increase, contrary to what the effect of increasing greenhouse-gas emission led many scientists to expect. However, industrial aerosols were also increasing at a rapid rate during the same period, until they became strongly regulated due to concerns about "acid rain." Inclusion of strong aerosol cooling would clearly tend to counterbalance the normal temperature increase from greenhouse gases alone. Additional work showed that a decrease in the amount of solar radiation reaching Earth's surface, called *global dimming,* coinciding approximately with the aforementioned flat temperature profile, ended in the late 1980s, and now we are experiencing *global brightening* along with a rapid global temperature rise (Wild et al. 2005). (It is important to note that this is *not* an increase in the solar flux impinging on the top of our atmosphere but only on the amount that reaches the ground.) If we consider these two recent developments together, much of the apparent mystery of the flat temperature profile in the

All major computer models that calculate a mean global surface temperature agree on the importance of greenhouse gases in driving global warming and climate change.

mid-twentieth century appears to go away. Current work on models is exploring this possibility, as our understanding of aerosols improves.

Until recently, another puzzle for GCM modelers was a disagreement between their model predictions and what appeared to be reliable observations showing that temperatures in the troposphere did not increase during the current period of a rapid rise in the mean global surface temperature. The models predicted the two temperatures should march together. However, a serious error was found in the calibration of the satellite data used for the tropospheric temperature measurements. When this error was corrected, it brought the two temperatures much closer together (Mears and Wentz 2005). Confidence in the models correspondingly increased.

While further work is required to improve climate models, it is clear that they are improving rapidly. Future climate predictions, while still only valid within a range, are also improving. A benchmark for the sensitivity of different models to the actual climate has been to compare their outputs by assuming a doubling of the atmospheric concentration of carbon dioxide since the beginning of the Industrial Revolution, a doubling that is now almost universally expected to occur. Between 1995 and the publication of the IPCC-2001 Science Report, there was little increase in the computed range of predicted global-temperature increases under this assumption, and the range was from 1.5 to 4.5 degrees centigrade (1.0 degree centigrade equals 1.8 degrees Fahrenheit). However, when the results of the improved, and generally considered best, three United States GCMs were compared in 2002, the range of predicted global temperature increases had been narrowed to 2.5–3.0 degrees centigrade (Kerr 2004). A rise of 2.5 degrees centigrade may not seem like much, but when we consider the climate changes that have already occurred in response to the *measured* increase in the twentieth century of 0.6 degrees centigrade (with an estimated uncertainty of 0.2 degrees centigrade), it becomes disturbing.

Summary

No scientist to date has made a strong case (i.e., one supported by a large number of his colleagues who publish in the refereed journals) for any observation(s) or mechanism(s) that can explain the current rapid global-warming trend by invoking natural causes. Arguments for solar forcing, for forcing by internal modes of the climate system (natural processes that operate within the Earth system itself), and for the urban heat-island effect, have either failed to offer hard evidence or have been completely discredited. Nor do Earth's long-duration, quasi-periodic, dynamical motions explain the current rapid temperature rise.

In contrast, global warming forced by a growing atmospheric concentration of greenhouse gases, especially carbon dioxide, is based on sound science that refers to a mechanism that is well understood and universally accepted by the scientific community. Models that incorporate this and many other known processes support this conclusion, and the models themselves, while still in need of improvement, are becoming increasingly reliable for making global predictions.

The probability is extremely high that human-generated greenhouse gases, with carbon dioxide as the major offender, are the primary cause of well-documented global warming and climate change today.

Acknowledgments

The author thanks Drew Shindell, of the Goddard Institute for Space Studies, for pointing out that there remain unsolved problems in the geology of southern Canada that could modify the current picture of what caused the eruption of floodwater know as the Younger Dryas. He also thanks Judith Pap, of the Goddard Space Flight Center, for reading the manuscript carefully and offering suggestions for clarification based on her expertise in assessing solar irradiance variation. Finally, appreciation is due to Ronald A. Lindsay, staff member and legal advisor to the Center for Inquiry, for ensuring both readability for an intelligent but not necessarily scientifically trained reader, as well as uniformity of format for the collection of papers of which this is but one.

A Position Paper from the Center for Inquiry Office of Public Policy, Washington, D.C. Reviewing Committee: Paul Kurtz, PhD, Thomas W. Flynn, Ronald A. Lindsay, JD, PhD, Toni Van Pelt—December 2006

References

Bréon, F.-M. 2006. How do aerosols affect cloudiness and climate? *Science* 313: 623.

Kerr, R.A. 2005. Confronting the bogeyman of the climate system. *Science* 310: 432.

MacAvaney, B.J., et al. 2001. Model evaluation. In *Climate Change 2001: The Scientific Basis*. New York: Cambridge University Press.

Mears, C.A., and E.J. Wentz. 2005. The effect of diurnal correction on satellite-derived lower tropospheric temperature. *Science* 309: 1548.

Nicholson, C., et al. 2006. Santa Barbara basin study extends global climate record. *EOS* 87 (21): 205.

North, G.R., Q. Wu., and M.J. Stevens. 2004. Detecting the 11-year solar cycle in the surface temperature field. In *Solar Variability and Its Effect on Climate Change,* J. Pap, and P. Fox, eds. American Geophysical Union Monograph #141.

Overpeck, J.T., et al. 2005. Arctic system on trajectory to new seasonally ice-free State. *EOS* 86(34): 309.

Overpeck, J.T., et al. 2006. Paleoclimatic evidence for future ice-sheet instability and rapid sea-level rise. *Science* 311: 1747.

Penner, J.E., et al. 2001. Aerosols. Their direct and indirect effects. In *Climate Change 2001: The Scientific Basis*. New York: Cambridge University Press.

Prather, M., et al. 2001. Atmospheric chemistry and greenhouse gases. In *Climate Change 2001: The Scientific Basis*. New York: Cambridge University Press.

Prentice, I.C., et al. 2001. The carbon cycle and atmospheric carbon dioxide. In *Climate Change 2001: The Scientific Basis*. Cambridge University Press.

Ramaswamy, V., et al. 2001. Radiative forcing of climate change. In *Climate Change 2001, The Scientific Basis*. New York: Cambridge University Press.

Sarmiento, J.L., and N. Gruber. 2002. Sinks for anthropogenic carbon. *Physics Today* (August): 30.

Sarmiento, J.L., and S.C. Wofsy. 1999. *A U.S. Carbon Cycle Science Plan*, prepared at the request of the U.S. Global Change Research Program.

Seager, R. 2006. The source of Europe's mild climate. *American Scientist* 94: 334.

Singer, S.F. 2002. *The Kyoto Protocol Is Not Backed by Science*. Arlington, Va.: The science and environmental policy project. (See especially discussion of the urban heat-island effect, p. 10.)

Soden, B.J., et al. 2005. The radiative signature of upper tropospheric moistening. *Science* 310: 841.

Stocker, T.F., et al. 2001. Physical climate processes and feedbacks. In *Climate Change 2001, The Scientific Basis*. New York: Cambridge University Press.

Westerling, A.L., et al. 2006. Warming and earlier spring increase western forest wildfire activity. *Science* 313: 940.

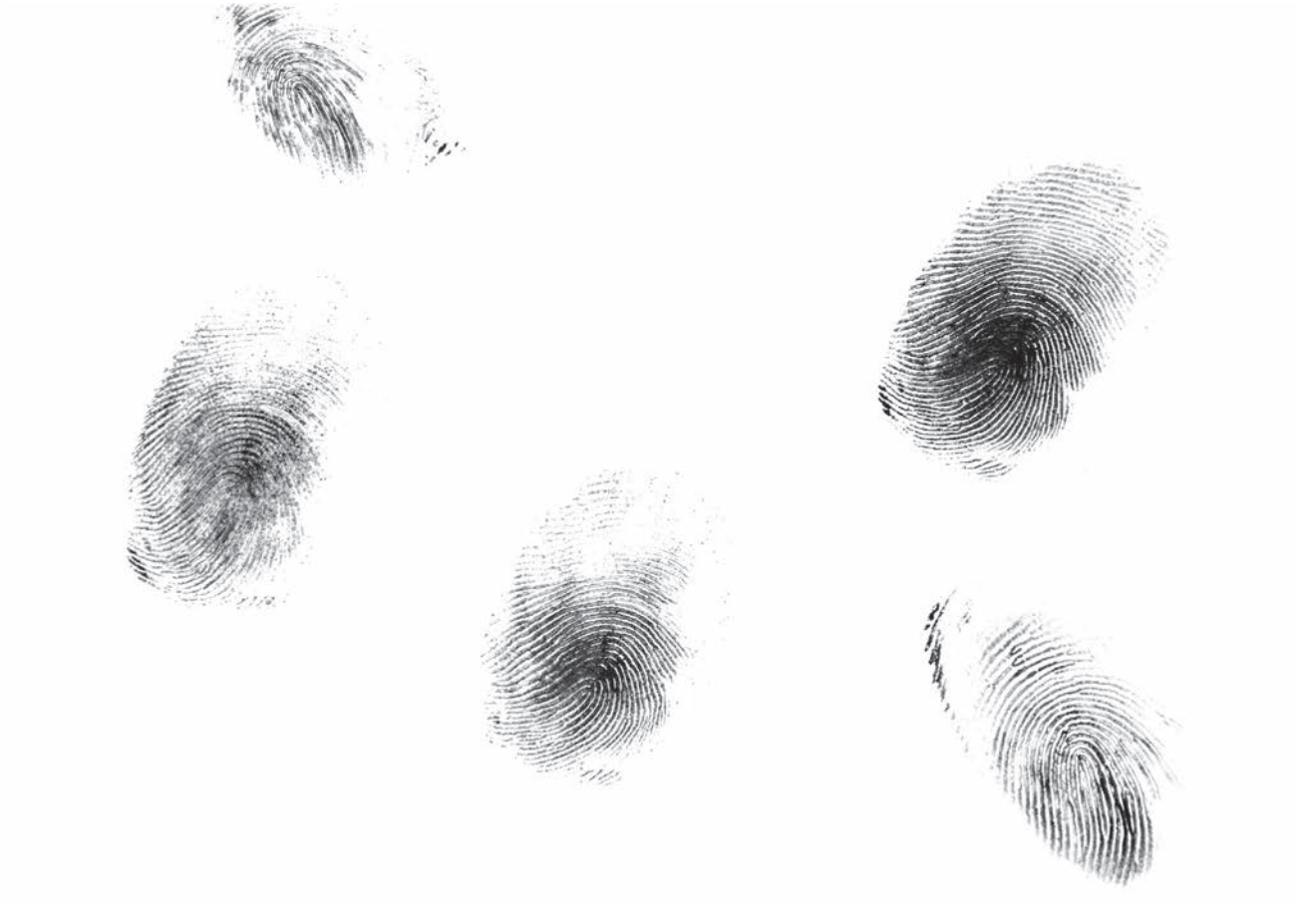
Wild, M., et al. 2005. From dimming to brightening: Decadal changes in solar radiation at the Earth's surface. *Science* 308: 847.

□

The Fingerprint Controversy

Astonishingly, one of the most trusted forms of forensic evidence, fingerprint identification, has yet to be validated. Lacking validation studies, proponents of fingerprint evidence have resorted to pseudoscientific arguments.

SIMON A. COLE



A group of self-professed experts claims to have developed a new technique that is able to analyze objects found at a crime scene and determine whether a particular individual touched that object. The technique is so powerful that it can determine that a touch was made by a particular individual uniquely—to the exclusion of all other individuals in the world.

When this new technique is offered into evidence in a criminal trial, the defendant objects and demands scientific proof that this technique can, in fact, do what it claims to be able to do. A hearing is held to evaluate the validity of the experts' claims.

At the hearing, the experts note that training in their technique is accomplished through an apprentice system. A background in science is desirable but not necessary to practice the technique. The experts have conducted no validation studies measuring the accuracy of their determinations of identity. They have conducted no studies of the rarity of the attributes they analyze in the human population. The experts can articulate no standard that governs when a determination is made that an individual touched an object; the experts simply "know it when they see it." Asked the error rate of their technique, the experts reply that it is zero. "A person either touched the object or he did not." When instances of error are pointed out, they claim that, in those cases, the method was "applied improperly."

Such "experts" would probably be laughed out of court. The courts would tell them to come back when they had some scientific data to show. Unless, of course, they were fingerprint experts.

Over the past eight years, a battle has been waged in courtrooms, on the Internet, and in journal articles over the scientific validity and legal admissibility of fingerprint evidence. As the controversy developed, the views of the legal and scientific communities have become increasingly out of sync, with judges unanimously decreeing fingerprinting "reliable" while an increasing number of voices from the scientific community have agreed that there is no empirical basis for such a conclusion.

The debate initially took place in obscurity, in the pages of law journals and isolated courtrooms. Gradually, however, the debate has percolated into the scientific and mainstream media, fueled in part by two recent high-profile misattributions, one by the vaunted FBI Latent Print Unit (Fine 2006) and one that resulted in the dismantling of the Boston Police Department's latent-print unit (Cole 2005). The National Academies are taking an interest (Mnookin 2003); the controversy was the subject of a panel at a recent NAS Sackler Colloquium (see www.nasonline.org/site/PageServer?page name=sackler_forensic). The editor of *Science* wrote an editorial about it (Kennedy 2003). Today, we find ourselves in a peculiar situation in which the scientific and legal communities are increasingly at odds over this issue. It is becoming increasingly difficult to find a credentialed scientist who will argue that latent-print identification has been validated, while the number of scientists who agree that it has not been validated has grown (Siegel et al. 2006). But, at the same time, not a single court has restricted the admissibility of latent-print identification, despite legal standards that clearly require proof of reliability for expert evidence to be admissible.

There is, of course, one crucial difference between the technique I imagined above and the venerated forensic technique of fingerprint (or, more precisely, "latent-print") identification: fingerprinting is not new. Unable to point to any validation studies or error measurements, longstanding use has emerged as fingerprinting's last-gasp defense. Echoing the arguments of the Ptolemains, defenders of fingerprinting have argued that techniques that have been used in criminal proceedings for a century must be accurate.

To be sure, the wide use of fingerprint identification for nearly a century counts for something. If the technique were highly inaccurate, if its accuracy was little better than chance, we would probably know it. A finding that a suspect's "friction-ridge detail" is consistent with an impression found at the scene of a crime has definite probative value in a courtroom and law-enforcement value for solving crimes and apprehending offenders. But inferring that it isn't wildly inaccurate is not the same as knowing that it is highly accurate. And it is certainly a far cry from the claims of infallibility advanced on behalf of fingerprinting (McRoberts, Mills, and Possley 2004; Federal Bureau of Investigation 1985).

Can science and law be reconciled? What is the empirical basis for latent-print examiners' extraordinary claims? Is fingerprinting accurate, or is it "junk science"?

Junk Science?

The lay public often interprets the term *junk science* to refer to claims that are just plain false. This is not exactly what Peter Huber meant when he popularized the term in his book *Galileo's Revenge* (1991). In Huber's view, clinical ecology is not junk science because it is wrong. The clinical ecologists may eventually turn out to be right that something in the environment causes certain illnesses, but this would not alter Huber's classification of clinical ecology as junk science. Clinical ecology is junk science because it has prematurely made causal claims without sufficient proof.

It is in the latter sense that we might appropriately call latent-print identification junk science. Latent-print identification is not junk science because it is necessarily wildly inaccurate, or because it is necessarily responsible for convicting enormous numbers of people (though it is responsible for wrongly convicting some people who are known to be innocent and, no doubt, some who are not [Cole 2005]). No one has advanced any proof that latent-print identification is highly inaccurate. In a very rough estimate based on poor (but the only avail-

Simon Cole is an associate professor of criminology, law, and society at the University of California, Irvine. He is the author of Suspect Identities: A History of Fingerprinting and Criminal Identification *(Harvard University Press, 2001) and numerous articles about fingerprinting, and he has testified as an expert witness on the validity of fingerprint identification. He is member of the American Judicature Society's Commission on Forensic Science and Public Policy. E-mail: scole@uci.edu.*

able) data, scholars have estimated that the false-positive error rate might be between 0.5 percent and 1 percent (Haber and Haber 2003; Cole 2005). That isn't a bad error rate (although, given that latent-print identification is deployed more than 200,000 times per year in the United States alone, it would account for a substantial number of wrongful convictions [Cole 2005]). The problem with latent-print identification is not that there is any proof that it is highly inaccurate; the problem with latent-print identification is that there isn't any measurement of how accurate it is. And, in the absence of accuracy, data defenders of fingerprinting have resorted to the worst rhetorical tricks of the pseudosciences. Latent-print evidence was admitted into courts in the early twentieth century before courts were sophisticated enough to demand accuracy data before admitting a technique that claimed the ability to make accurate source attributions (Cole 2001). Latent-print examiners assured courts the technique was infallible, and the courts accepted the assurance. Eventually, the courts' own restatements of the supposed infallibility of fingerprinting became the evidence for that infallibility (Cole 2004). If you ask a prosecutor for literature supporting the claim that fingerprinting has been validated, he or she is likely to refer you to a legal opinion. No one could have been more surprised than the latent-print examiners when defense attorneys announced, in the late 1990s, that the U.S. Supreme Court's opinion in the landmark 1993 expert-evidence case *Daubert v. Merrell Dow Pharmaceuticals* now required evidence of reliability—even of techniques that had been admissible for nearly a century (Saks 2000). Cornered without any validation studies and little idea how to conduct them, the latent-print examiners and prosecutors who were charged with defending a technique that they *just knew* was highly accurate lapsed into drawing on all the typical rhetorical techniques used by pseudosciences. It is the arguments mounted in defense of latent-print identification, not latent-print identification itself, that constitute the true junk science. Paradoxically, defenders of fingerprinting may well have invoked pseudoscientific argument in defense of a highly accurate technique (Cole 2003).

The Pseudoscientific Defense of Fingerprinting

Perhaps the earliest argument mounted in defense of fingerprinting was "the fingerprint examiner's fallacy" (Cole 2004). Fingerprint proponents reasoned that if all human fingerprint patterns are unique (itself no more than an assumption, though a plausible one), fingerprint identification must be 100 percent accurate. The fallacy is seductive: although it might be argued that at least one thinker recognized the fallacy early on (Faulds 1905), it took nearly a century before even sophisticated minds were able to shake free of it (Stoney 1997; Woodworth 1997). Nonetheless, once considered carefully, the flaw in reasoning is

The Role of SI in the Fingerprint Controversy

Although this article marks the first treatment of the fingerprint controversy in SKEPTICAL INQUIRER, SI has already played a little-known role in it. In an obscure 2001 New York burglary case, *People v. Hyatt*, the defendant called me to testify to the limitations of latent-print evidence. The state objected and asked the judge to preclude me from testifying. The judge's opinion holding that I would not be permitted to testify accused me of practicing "junk science." The opinion was quickly posted on the Internet under headlines like "Critical Author's Opinion Ruled Junk Science" (www.forensicevidence.com/site/ID/Cole_junksci.html) and gained a certain amount of notoriety among those who were following the controversy.

The opinion concludes that I was practicing "junk science" and "essentially playing the role of a Doubting Thomas." In support of this conclusion, it refers to the only nonlegal source cited in the opinion, an article in SI by John E. Dodes (2001):

> Skeptics are involved in many aspects of solving society's problems from a rational perspective. Yet few realize the insidious and negative effect our legal system can have on the establishment and propagation of logic and science. From the Scopes trial to silicone breast implant litigation, some courts have demeaned science and promoted junk science. The system must be changed. By incorporating a standardized policy with adherence to stringent rules regarding the admission of scientific evidence most of these results can be avoided. (Dodes, John E. 2001. Junk science and the law. The *Skeptical Inquirer* 25[4] [July/August]: 31.)

It is unclear what connection the court saw between Dodes's article and my testimony. But the Hyatt court's invocation of Dodes and SI to discredit me seems ironic. Latent-print examiners invoke many of the same tactics denounced in the pages of SI: a refusal to test their claims; the reliance on "experience" rather than experiment as the basis for expert knowledge; the creation of self-credentialing institutions; and the invocation of *ad hoc* explanations for exposed cases of error. Dodes's definition of junk science—"conclusions are drawn using low-quality data such as testimonials, anecdotes, and case reports rather than from randomized, controlled clinical experiments"—would seem to jibe very well with latent-print identification. Similarly, Dodes's normative suggestion of "incorporating a standard policy with adherence to stringent rules regarding the admission of scientific evidence" seems to accord well with the thrust of my testimony, which was, after all, to hold fingerprinting to a reasonably stringent interpretation of the legal standards for expert evidence.

—Simon A. Cole

obvious. One cannot infer the reliability of a source-attribution technique solely from the rarity of the target object.

The fingerprint examiner's fallacy remains the largest obstacle to clear discussion and reasoned debate over the merits of latent-print identification. Practitioners, courts, scholars, and journalists continue to state that the controversy over latent-print identification concerns whether or not all human fingerprint patterns are unique. It does not. The controversy concerns the accuracy of latent-print examiners' source attributions. Rhetorically, the fingerprint-examiner's fallacy serves defenders of fingerprinting well; it allows them to portray those "critics" who venture the now undisputed point that the accuracy of forensic fingerprint identification remains unmeasured as radical skeptics who hold to the absurd position that human beings are walking around with exact-duplicate fingerprint patterns on their fingers. It also allows latent-print examiners to purport to "prove" the uniqueness of human fingerprint formations, in the guise of addressing the accuracy of fingerprinting. If you ask a latent-print examiner for scientific proof that fingerprinting is accurate, he or she is likely to refer you to an embryology text detailing the formation of the friction-ridge skin that produces what we know as fingerprint patterns (Cole 2006).

The fingerprint examiner's fallacy remains the largest obstacle to clear discussion and reasoned debate over the merits of latent-print identification.

However, even with the fingerprint-examiner's fallacy set aside, defenders of fingerprinting have adopted rhetorical tactics that will be disturbingly familiar to scientific skeptics. Chief among them is the last refuge of the pseudoscientist: the Ptolemaic appeal to longstanding belief, a sure sign of bogus science (Park 2003). A leading FBI examiner told *60 Minutes,* "We have one hundred years of experience; let's make sure that that's clearly out there. And if it wasn't reliable, this certainly would have been discovered many, many years ago" (Fingerprints 2003). The Fourth Circuit Court of Appeals noted approvingly that fingerprinting had "withstood the test of time" (*United States v. Crisp* 2003). Some expressions of this view are almost medieval. One government brief on the issue called demanding empirical proof of the accuracy of an expert group with "one hundred years of experience" an argument "only an academic could make with a straight face" (*State v. Columbus* 2006).

On other occasions, practitioners have argued that criminal trials in which fingerprint evidence was used constitute the scientific experiments that skeptics have demanded. Thus, in the first legal challenge to latent-print identification, the government contended that "the experts' conclusions have been tested empirically over a period of one hundred years" (*United States v. Mitchell* 1999). The empirical testing referred to was apparently criminal cases in which a latent-print examiner *said* that a defendant made a certain latent print. If this assertion was not refuted somehow (by what?), the empirical tests purportedly supported the accuracy of the examiner's conclusion. This definition of a scientific experiment would, of course, be quite well suited to validate trial by ordeal (Dorf 2002); the "experiments" measure whether the technique is persuasive, not whether it is accurate. But the argument has been taken surprisingly seriously by the courts, one of which confidently opined "the methods of latent print identification can be and have been tested. They have been tested for roughly one hundred years. They have been tested in adversarial proceedings with the highest possible stakes—liberty and sometimes life" (*United States v. Havvard* 2000). The U.S. Court of Appeal for the Third Circuit called this "implicit testing" (*United States v. Mitchell* 2004), and the term was *not* meant as a criticism.

Perhaps the most astonishing claim has been that the error rate of latent-print identification is zero, even in the case of known cases of error. Latent-print examiners explain that the technique cannot err, "if the methodology . . . is properly applied" (Grieve 2001).

The Accuracy of Latent-Print Identification

It is crucial to be clear about the claim that latent-print examiners are advancing. Given a "latent print" of "sufficient" quality found at a crime scene, latent-print examiners claim to be able to identify the anatomical source of that print by means of comparisons to "exemplar" prints made deliberately from candidate sources. They claim that they can exclude *all other possible sources in the universe* as potential sources of the latent print. Current latent-print practice guidelines brook no probabilities to be associated with these determinations; the determinations are purportedly "absolute" or "positive" (Scientific Working Group on Friction Ridge Analysis Study and Technology 2002).

A skeptic faced with such a claim would demand proof—controlled studies in which (unlike in, say, criminal trials) the ground truth is known—that measure the rate at which examiners make correct source attributions. It is this type of study that defenders of fingerprinting have not been able to produce. The closest thing to such a study is a set of proficiency tests of unknown difficulty that have been conducted anonymously by mail since 1983. In the absence of better data, scholars have compiled the results of these studies (Haber and Haber 2003; Cole 2005; Peterson and Markham 1995; Thornton and Peterson 2002), but latent-print examiners themselves have objected strenuously to inferring accuracy rates from this data

(Langenburg 2002). If we grant this argument, we are back where we started: there is no accuracy data.

The very first study containing accuracy data was finally published just recently, finding very high accuracy rates in a class of trainees on latent prints of unknown difficulty; but the study contains some methodological flaws (Haber and Haber 2006). Moreover, the authors again argue strongly against inferring accuracy rates from their own data (Wertheim, Langenburg, and Moenssens 2006).

In the absence of accuracy data, what then may be said about the accuracy of latent-print identification? Recently, some of the more scientifically minded examiners, unwilling to make the flawed argument that criminal trials constitute scientific trials of the ultimate accuracy of the evidence presented in them, have fallen back on the "longstanding-use" argument. Latent-print identification has been widely used in criminal-justice proceedings for nearly a century. No one knows how many deployments of latent-print analysis have been conducted during that period, but the number is clearly large. (The Bureau of Justice Statistics reports more than 200,000 requests for latent-print analysis in the U.S. alone during the year 2002.) At the same time, the number of those deployments that are known to be erroneous is quite small.

It is important to emphasize that the likelihood that misattributions would be exposed appears to be quite small. Latent-print evidence enjoys an enormously high degree of trust in our criminal-justice system, and anyone unfortunate enough to be implicated in a crime by erroneous latent-print evidence would need powerful evidence to trump the fingerprint. We must, therefore, be extremely cautious about inferring the number of *actual* misattributions from the number of *exposed* misattributions. Nonetheless, with that caveat notwithstanding, it seems obvious that if latent-print identification were highly inaccurate even the number of exposed misattributions would be higher than it is.

It is, therefore, perhaps reasonable to conclude the century of use of latent-print identification in the criminal justice system provides evidence that the technique is not wildly inaccurate. But it is difficult to conclude much more than that. Would this conclusion of a reasonable degree of accuracy be sufficient to meet the legal requirement of evidence of "reliability"? Probably. But, then, we return to the stubborn fact that latent-print examiners *claim* accuracy rates much higher than they can support. Indeed, some leaders in the field coach their peers to tell juries that the error rate is zero (Wertheim 2001). And recall that identifications have to be nonprobabilistic, absolute, and claiming to exclude all potential donors in the universe.

Conclusion

The real scandal of the fingerprint controversy is less about the ultimate accuracy of fingerprinting itself than about the abuse of science in the legal system. Judges, no doubt, have an instinctual sense that latent-print identification is highly accurate, a sense that is surely shared by many and that may not be wrong, and they probably feel that justice would not be served by restricting it. Such pragmatic decisions are not necessarily improper for judges, but they ought not be couched as "following the law" when the law clearly demands evidence of reliability. The courts' willingness to do violence to logic and scientific reasoning in order to avoid an uncomfortable outcome should be disturbing to all defenders of science, regardless of their opinion of fingerprinting. So far, the fingerprint controversy has seen enshrined in the legal record such notions as "adversarial" and "implicit" testing, "the test of time," and the "zero error rate." Perhaps the most egregious example of violence to basic scientific concepts was the court that ruled that an unpublished FBI study met the legal "peer review and publication" requirement because it had been severely criticized in journal articles that were themselves peer-reviewed and published (*State v. Sullivan* 2005). Another recent opinion dismissed the argument that the views of mainstream scientists were relevant to the question of whether latent-print identification had been validated. Instead, it ruled that latent-print examiners themselves could constitute the "relevant scientific community" to evaluate their own knowledge claims (*Commonwealth v. Patterson* 2005). Under this precedent, there would be nothing to prevent astrologers from constituting their own relevant scientific community—nothing, that is, other than judges' instinctive sense of the reliability of astrology.

References

Cole, Simon A. 2001. *Suspect Identities: A History of Fingerprinting and Criminal Identification*. Cambridge, Mass.: Harvard University Press.

———. 2003. Fingerprinting: The first junk science? *Oklahoma City University Law Review* 28(1):73–92.

———. 2004. Grandfathering evidence: Fingerprint admissibility ruling from *Jennings* to *Llera Plaza* and back again. *American Criminal Law Review* 41(3):1189–1276.

———. 2005. More than zero: Accounting for error in latent fingerprint identification. *Journal of Criminal Law and Criminology* 95:985–1078.

———. 2006. Is fingerprint identification valid? Rhetorics of reliability in fingerprint proponents' discourse. *Law and Policy* 28(1).

Commonwealth v. Patterson. 2005. 840 N.E.2d 12 (Mass.).

Daubert v. Merrell Dow Pharmaceuticals. 1993. 509 U.S. 579.

Dodes, John E. 2001. Junk science and the law. SKEPTICAL INQUIRER, 25(4) (July/August): 31–34.

Dorf, Michael C. 2002. Admitting Error and Admitting Fingerprints: Is There a Sound Factual Basis for The Law? FindLaw, 3/20/02 2002 [cited 3/25/02 2002]. Available at http://writ.news.findlaw.com/dorf/20020320.html.

Faulds, Henry. 1905. *Guide to Finger-Print Identification*. Hanley: Wood Mitchell.

Federal Bureau of Investigation. 1985. *The Science of Fingerprints: Classification and Uses*. Washington, D.C.: United States Government Printing Office.

Fine, Glenn A. 2006. A Review of the FBI's Handling of the Brandon Mayfield Case: U.S. Department of Justice Office of the Inspector General, available at http://www.usdoj.gov/oig/special/s0601/final.pdf.

Fingerprints. 2003. *60 Minutes* telecast (CBS News, Jan. 5).

Grieve, David L. 2001. Simon says. *Journal of Forensic Identification* 51(1): 85–97.

Haber, Lyn, and Ralph Norman Haber. 2003. Error rates for human fingerprint examiners. In *Automatic Fingerprint Recognition Systems*, edited by N.K. Ratha and R. Bolle. New York: Springer-Verlag.

———. 2006. Letter re: A report of latent print examiner accuracy during comparison training exercises. *Journal of Forensic Identification* 56 (4):493–499.

Huber, Peter W. 1991. *Galileo's Revenge: Junk Science in the Courtroom*. New York: Basic.

Kennedy, Donald. 2003. Forensic science: Oxymoron? *Science* 302:1625.

Langenburg, Glenn. 2003. *Defending Against the Critic's Curse*. CLPEX, September, 2002 (cited 21 Aug. 2003). Available at www.clpex.com/Articles/CriticsCurse.htm.

McRoberts, Flynn, Steve Mills, and Maurice Possley. 2004. Forensics under the microscope. *Chicago Tribune*, Oct. 17.
Mnookin, Jennifer L. 2003. Fingerprints: Not a gold standard. *Issues in Science and Technology* 20(1):47–54.
Park, Robert L. 2003. The seven warning signs of bogus science. *Chronicle of Higher Education*, Jan. 31, B20.
Peterson, Joseph L., and Penelope N. Markham. 1995. Crime laboratory proficiency testing results, 1978–1991, II: Resolving questions of common origin. *Journal of Forensic Sciences* 40(6):1009–1029.
Saks, Michael J. 2000. Banishing *Ipse dixit*: The impact of *Kumho Tire* on forensic identification science. *Washington and Lee Law Review* 57:879–900.
Scientific Working Group on Friction Ridge Analysis Study and Technology. 2002. Friction Ridge Examination Methodology for Latent Print Examiners, ver. 1.01, available at http://www.swgfast.org/Friction_Ridge_Examination_Methodology_for_Latent_Print_Examiners_1.01.pdf.
Siegel, David M., Stanley Z. Fisher, Daniel Givelber, et al. 2006. The reliability of latent print individualization: Brief of *amici curiae* submitted on behalf of scientists and scholars by the New England Innocence Project, *Commonwealth v. Patterson*. *Criminal Law Bulletin* 42(1):21–51.
State v. Columbus. 2006. State's Memorandum in Support of Admitting Latent Fingerprint Identification Testimony, No. 05-4980, Minn. D. Ct. Hennepin Cty.
State v. Sullivan. 2005. No. 03S 1635, et al. N.H.
Stoney, David A. 1997. Fingerprint Identification: Scientific Status. In *Modern Scientific Evidence: The Law and Science of Expert Testimony*, edited by D.L. Faigman, D.H. Kaye, M.J. Saks, and J. Sanders. St. Paul, Minn.: West.
Thornton, John I., and Joseph L. Peterson. 2002. The general assumptions and rationale of forensic identification. In *Science in the Law: Forensic Science Issues*, edited by D.L. Faigman, D.H. Kaye, M.J. Saks, and J. Sanders. St. Paul, Minn.: West.
United States v. Crisp. 2003. 324 F.3d 261 (4th Cir.) In *F.3d.*: 4th Cir.
United States v. Havvard. 2000. 117 F.Supp.2d 848 (S.D. Ind.) In *F.Supp.2d*: S.D. Ind.
United States v. Mitchell. 1999. *Government's Post-Daubert Hearing Memorandum*: Cr. No. 96-407, E.D. Pa.
United States v. Mitchell. 2004. 365 F.3d 215 (3d Cir.)
Wertheim, Kasey. 2001. *The Weekly Detail*, Aug. 6, 2001 available at http://www.clpex.com/Articles/TheDetail/TheDetail1.htm.
Wertheim, Kasey, Glenn Langenburg, and André Moenssens. 2006. A report of latent print examiner accuracy during comparison training exercises. *Journal of Forensic Identification* 56(1):55–93.
Woodworth, Fred. 1997. A printer looks at fingerprints. *The Match!* Winter: 36–39. □

CENTER FOR INQUIRY

The Future of Naturalism

September 20–22, 2007 • Center for Inquiry/Transnational, Amherst, N.Y.

Cosponsored by the Center for Inquiry/Transnational and the State University of New York at Buffalo Philosophy Department, with support from the C.S. Peirce Professorship in American Philosophy, the Marvin Farber Memorial Fund, and the George F. and Celeste Hourani Memorial Fund

Naturalism has achieved a dominant place on the world's intellectual scene, elevated by science's spectacular achievements. The philosophical effort to grapple with the wider implications of the scientific worldview must keep pace with science's ceaseless advances. Philosophical naturalism must understand both the power and limitations of scientific methodology. Can science realistically describe nature's workings, progressively expand our knowledge through intellectual revolutions, integrate the human being into nature, and help guide the quest for improving the human condition? The future of naturalism will ultimately depend on the answers to such questions, and this conference on "The Future of Naturalism" brings together many leading thinkers who are working on them. Speakers will discuss many crucial topics, including science's claims to know reality, how mind and experience might fit into nature, the implications of naturalism for ethics and law, the conflicts between religion and naturalism, and the varieties of naturalism.

Scheduled Speakers
John Peter Anton (University of South Florida), **Akeel Bilgrami** (Columbia University), **Arthur Caplan** (University of Pennsylvania), **Randall Dipert** (University at Buffalo), **Paul Draper** (Purdue University), **Owen Flanagan** (Duke University), **Ronald Giere** (University of Minnesota), **James Gouinlock** (Emory University), **Adolf Grünbaum** (University of Pittsburgh), **Terry Horgan** (University of Arizona), **Hilary Kornblith** (University of Massachusetts), **Paul Kurtz** (Center for Inquiry), **John Lachs** (Vanderbilt University), **Brian Leiter** (University of Texas), **Isaac Levi** (Columbia University), **Joseph Margolis** (Temple University), **Lynn Hankinson Nelson** (University of Washington), **Laura Purdy** (Wells College), **Nicholas Rescher** (University of Pittsburgh), **David Rosenthal** (City University of New York), **John Ryder** (State University of New York), **Charlene Haddock Seigfried** (Purdue University), **Harvey Siegel** (University of Miami), **John E. Smith** (Yale University), **Ernest Sosa** (Brown University), **Victor J. Stenger** (University of Hawaii), and **Michael Tye** (University of Texas)

Visit the conference's Web site at www.naturalisms.org/2007
For more information about the CFI's Naturalism Research Project and other upcoming events, see www.centerforinquiry.net/research.

The Earth and Stars in the Lunar Sky

One argument by proponents of the Apollo-hoax theory is the lack of stars in photographs from the lunar surface. While the sunlit surface is much too bright to yield properly exposed images showing stars in visible-light photographs, stars are easily visible in images taken using the ultraviolet camera carried to the Moon by Apollo 16. The stars seen behind Earth can be identified on those images, and interested readers can do so using the Web.

WILLIAM C. KEEL

One of the arguments regularly used by those claiming that the Apollo lunar landings were faked is the absence of stars in the sky as seen in the many photographs of the lunar surface. Background stars will not appear in ordinary exposures of the sunlit lunar surface (or indeed such nocturnal scenes as brightly lit sports stadiums), because of the dynamic-range limitations of film. The exposures needed to show even bright stars are so long compared to those needed for the surface that the sunlit areas are completely washed out, as experimentation with a floodlit parking lot at night will confirm. However, the absorption (mostly from ozone) in its atmosphere makes the Earth dim in the ultraviolet-lit images, so that a set of photographs

Figure 1. Apollo 16 image of the S201 ultraviolet camera and spectrograph as erected in the shadow of the lunar module, illuminated only indirectly by light reflected from the lunar surface. Astronaut Charles Duke is also in shadow, silhouetted against the bright background. (Credit: NASA, photograph AS16-114-18439)

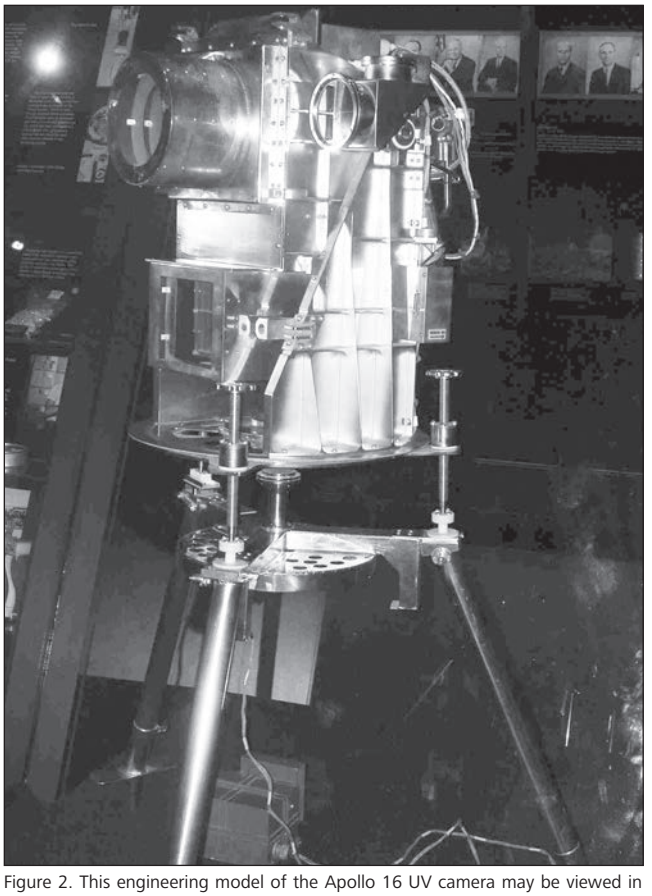


Figure 2. This engineering model of the Apollo 16 UV camera may be viewed in the National Air and Space Museum in Washington. The main aperture is at upper left, with the supplementary aperture for spectral measurements below it.

taken from the lunar surface with an ultraviolet (UV) camera does show the Earth with numerous background stars. Confirming the identity of these stars, and thus that the vantage point of the pictures was indeed on the Moon at the time claimed, is an interesting exercise. This can be done solely with resources available on the World Wide Web, and the project can easily be adopted for educational purposes.

William C. Keel is in the Department of Physics and Astronomy at the University of Alabama. E-mail: Keel@bildad.astr.ua.edu.

An Ultraviolet Telescope on the Moon

Following discussions with astronomer Thornton Page, George Carruthers of the Naval Research Laboratory designed and supervised construction of an ultraviolet camera and spectrograph system (experiment S201) to be used on the lunar surface by the Apollo 16 astronauts (specifically, mission commander John Young). Building on experience with sounding-rocket payloads, this device (figures 1 and 2) used an all-reflecting Schmidt optical system of aperture 7.5 cm to give definition over a wide twenty-degree field, and took advantage of the slow lunar rotation to allow relatively long exposures with the fixed camera. For greatest efficiency, Carruthers employed electronographic recording, in which the 35mm film registers electrons liberated from a photocathode and magnetically focused, rather than registering the ultraviolet radiation directly. (Young commented that he could confirm that magnets worked on the Moon as well, as it attracted metal in his spacesuit arm.) This magnetic focusing step produces some radial distortion in the images, which must be corrected for precise position measurements. The highest-priority images for this first lunar observatory were of the Earth. The lunar vantage point was especially important for tracing the extensive halo of escaping hydrogen atoms from Earth (the geocorona), and allowed a global view of the airglow whose physics has long engaged atmospheric scientists. While the Earth is faint in the UV, the Moon is not; care was taken to keep the lunar surface out of the field of view, even though some exposures were planned to look just above mountains for evidence of escaping gases that might fluoresce in sunlight.

The Earth images from the Apollo 16 S201 experiment have been widely reprinted. Their first publication in a scholarly form was by Carruthers and Page (1972) only a few months after the mission. Several versions of the pictures may be found on the World Wide Web, including one—ironically mirror-reversed—in the gallery section of NASA's Web site. A Google image search for "Apollo 16 Earth" turns up six copies of three different enhanced versions of these pictures. Searching for "Apollo 16 UV" yields seven copies of four images, including a UV spectrum of the Earth. For showing background stars, the image listed as AS16-123-19650 is a particularly good one (available, for example, from http://images.jsc.nasa.gov). In each case, the pictures may be mirror-flipped or rotated compared to the view in the sky, and will inevitably have a rotation relative to a star map (if only because the camera was mounted on an altitude-azimuth system on the lunar surface, having no particular relation to celestial coordinates based on Earth's rotation). This image is shown in figure 3, oriented for convenience with celestial north about thirty degrees counterclockwise from the top. This star field is rather sparse compared to some other exposures from the camera, because even the ozone-dimmed

Earth is very bright compared to other astronomical targets. Earth exposures ran from one second to ten minutes, while deep-sky photographs were exposed up to five hours (and up to sixteen hours for spectroscopic observations of the diffuse sky background, done during astronaut sleep and rest periods). Even so, the picture in figure 3 shows more than thirty stars whose positions and brightness can define the region of the sky seen.

Earth Photographs and Their Background

Matching this star field requires knowing the date and time of the pictures, which implies where Earth appeared from the Moon. An ordinary Web search does not turn up a Web-accessible list of S201 exposures and times, so a little backwards work is necessary. The Apollo Lunar Surface Journal (Jones 2005) gives a communications transcript with time stamps, which shows that Earth photography started at mission elapsed time (MET) of 120 hours, 33 minutes. Since the mission launched at 12:54 EDT on April 16, 1972, that elapsed time puts these Earth photographs near 12:00 CDT (18:00 Universal Time) on April 21. (In fact, this information is available in section thirteen of the Apollo 16 Preliminary Science Report, which has a press date of January 1, 1972, and is available as a scanned PDF file from http://ntrs.nasa.gov. Carruthers' diagram of the illuminated portion of the Earth, figure 13-8 of that volume, is drawn for 1851 Universal Time.)

Next, where would Earth have appeared in the lunar sky? Some popular PC planetarium programs (I used Guide8 from Project Pluto) will show the view from other bodies in the solar system. However, the problem can be worked using only the view from Earth—by noting that Earth and the Moon will appear in opposite directions in one another's skies, so that we really need only know where the Moon is from Earth at that time. Several Web services provide interactive sky charts that will answer this question (e.g., www.heavens-above.com, www.skyandtelescope.com, www.fourmilab.ch/yoursky/). The result tells us that Earth appeared at about right ascension twenty-one hours fifteen minutes, declination -15° 16', near the boundary between the zodiacal constellations Capricornus and Aquarius, and nearly overhead from the Apollo 16 landing site.[1]

What orientation should the picture have compared to a sky map? The sunlit crescent should point north-northeastward toward the sun, since Earth's phase will appear as the complement of the lunar phase seen from Earth. In addition, since the Moon looked at Earth from north of its equator, the equatorial airglow bands (figure 3) will be concave to the north. (These bands fall roughly on either side of the magnetic rather than geographic equator, but the distinction is minor enough that the apparent curve of the equator is still clear.)

Stars in Visible and Ultraviolet Light

What stars should we see? The whole point of the S201 experiment was observations deep into the ultraviolet, which is absorbed by our ozone layer, and further compromised by airglow and the so-called geocorona to surprisingly high altitudes. The UV instrument was most sensitive to stars rather hotter than the sun, which emit a larger fraction of their radiation at these short UV wavelengths. This makes the sky seen in the UV images quite different from the visual appearance shown in star maps and planetarium programs. Some such programs will color-code stars according to spectral type, or show the spectral types upon query, making the matching process easier. Unless they are very bright, the UV image registers stars only of broad spectral classes O, B, and A—roughly corresponding to surface temperatures greater than 8000°K (Cox 2000). Indeed, all the stars matched to bright stars in visible-light maps fall in these spectral groups.

Figure 3. One of the ultraviolet images of Earth and background stars from the S201 camera carried to the lunar surface by Apollo 16. This image is listed as AS16-123-19657. Celestial north is to the upper left, about thirty degrees counterclockwise from the top, and the field of view shown is roughly eighteen degrees on a side. Credit: NASA

Taking advantage of the fact that a Belgian/U.K./Dutch satellite, TD-1, launched on March 11, 1972, scanned the sky for stars bright in the ultraviolet over the next two years makes the answer to this query even simpler. Its data are available starting with a search using the NASA Skyview Web interface (http://skyview.gsfc.nasa.gov), by requesting TD-1 as a catalog overlay, or a position search on its catalog data from heasarc.gsfc.nasa.gov. These results then link to tabular output; of its passbands, the shortest 1565-Angstrom (156-nm) one is the closest match to the Apollo 16 data. The TD-1 data do have limitations, including blending of close star images, but are a great help in connecting the visual star patterns with what shows up in the ultraviolet. Indeed, because of the short Earth exposures, TD-1 detected more stars then we see in figure 3, and mapping the brightest of these over a twenty-degree field immediately matches the Apollo 16 imagery. The advantage of this step is that these sources come with catalog coordinates for easy correlation with the visible-light star patterns. (Those suspicious about the trail of evidence may note that,

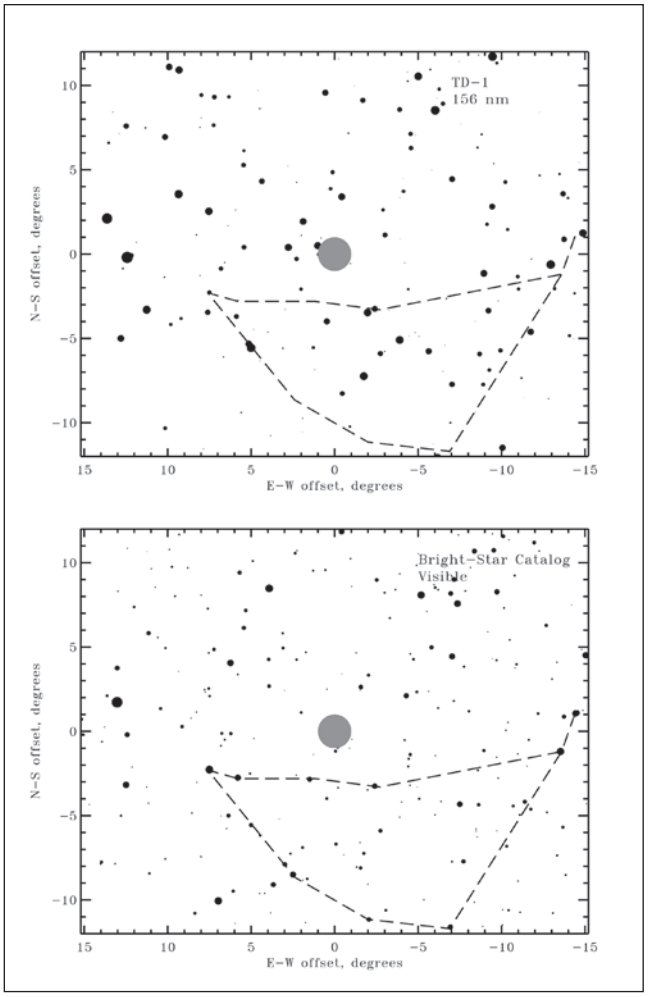


Figure 4. Star maps in visible and ultraviolet light, with the location of Earth during the Apollo 16 photographs shown to scale by the shaded circle. The dashed outline shows a common outline of the constellation Capricornus for orientation and is in the same locations in both maps. The UV map was constructed from the brightest stars recorded by the TD-1 sky-survey satellite at 156 nm, closest to the wavelength band of the Apollo 16 picture, and may be directly compared to one of those pictures in figure 3.

although using the UV star catalog makes this step easier, it is not necessary; I tried it first directly from a visual star map. Furthermore, the TD-1 mission had not yet mapped more than a small part of the sky by the time the Apollo 16 pictures were first published, let alone obtained.) Figure 4 compares the deep-UV map of the sky around the Earth constructed from the TD-1 catalog at 156 nm to the visual appearance, plotted using the Yale Bright-Star Catalog. The familiar "clown smile" outline of stars in Capricornus is shown for reference in both charts. Only a few of the stars are both bright in visible light and the deep ultraviolet, but enough stars are in common to match the background in the Apollo 16 imagery even from a visible star catalog alone.

Putting all these steps together, what are the stars seen behind Earth? Readers preparing to follow through this exercise may want to skip looking at the summary in figure 5 until they've tried it for themselves. The UV-brightest stars are both visually bright and hot—the B5 star ε Capricorni and A0 star ε Aquarii. Other A-type stars also prominent in the

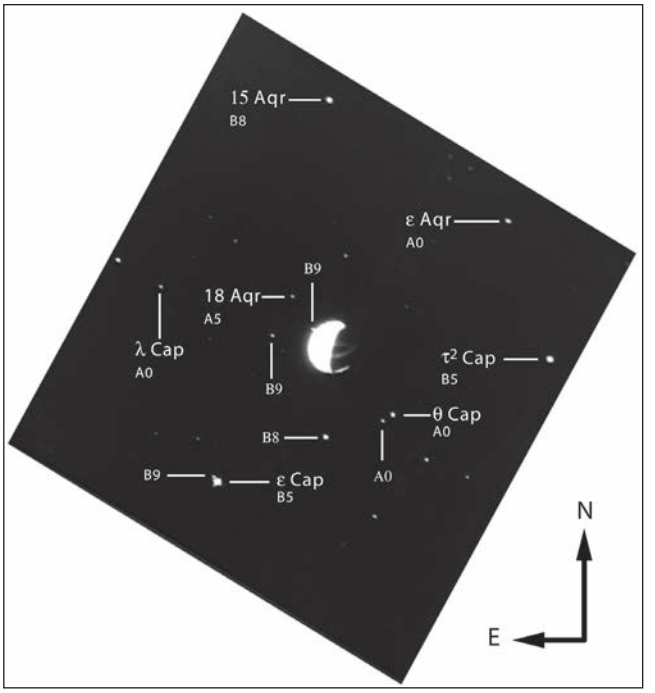


Figure 5. The Apollo 16 UV image from figure 3, now displayed with north at the top for easy comparison with the UV star map in figure 4, and with some of the prominent stars labeled. Some faint stars with no naked-eye catalog designation are marked simply by their spectral types.

UV image, including some so faint visually as to have no common catalog name (for which only a spectral type is shown in figure 5.) With these as a start, essentially all the stars seen in figure 3 have counterparts in the UV catalog of figure 4, and five of them, as indicated, are prominent naked-eye stars with Greek letter designations. This exercise provides an independent set of Apollo results to test for internal consistency, in this case with the star pattern showing the Earth in the right place for the time of the mission, and with relative star brightness in the deep ultraviolet that was not known before the flight of Apollo 16.

Acknowledgements

Thanks to James Oberg for the challenge of seeing whether motivated high school students could perform this test, to Barry Karr for the suggestion to write this article, and to George Carruthers for a phone interview on the S201 experiment and its background.

Note

1. Astronomers use angular coordinates to define locations of objects in the sky. Keyed to the axis and equator of Earth as projected outwards into space, these coordinates—right ascension and declination—are analogous to longitude and latitude on the surface of the globe. By tradition, right ascension is measured in hours, minutes, and seconds eastward from an agreed reference direction, while declination is in the usual angular units of degrees, minutes, and seconds north or south of the celestial equator. When plotting a star chart with north at the top, right ascension will increase from right to left. One hour of right ascension along the celestial equator spans 15 degrees in angle.

References

Carruthers, George R., and Thornton Page. 1972. Apollo 16 Far-Ultraviolet Camera/Spectrograph: Earth Observations. *Science* 177: 788–791.

Cox, A.N. (ed.). 2000. *Allen's Astrophysical Quantities.* 4th ed. (American Institute of Physics), pp. 151–153.

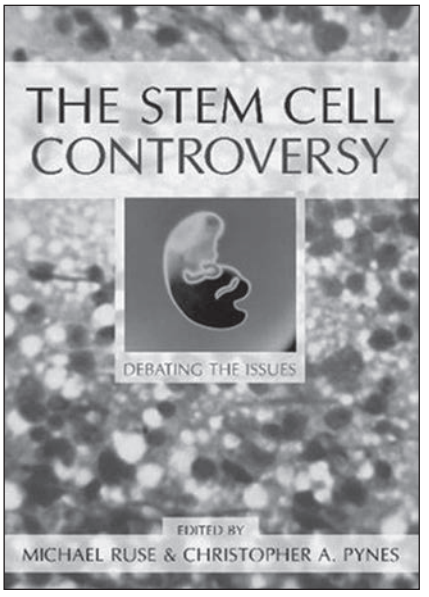
Addressing the Crucial Issues of Stem-Cell Research

KENNETH W. KRAUSE

The Stem Cell Controversy: Debating the Issues, 2nd Edition. Michael Ruse and Christopher A. Pynes, eds., Amherst, N.Y.: Prometheus Books, 2006. ISBN: 978-159102-404-0. 367 pp. $22, softcover.

Parkinson's disease results from the death of nigral neurons, the dopamine-producing brain cells that facilitate signal transmission between nerve cells. Neuroscientists have successfully grafted fetal neurons into the brains of Parkinson's patients, dramatically relieving some sufferers' symptoms. But six fetuses are needed to treat just one patient, in part because transplanted cells perish at a rate of 90 percent shortly after grafting. As such, there will never be enough fetal tissue to treat all of the people who need it, and, according to science writer Marcia Barinaga, that is precisely why researchers are "pinning their hopes on cultured stem cells" that could potentially produce an unlimited supply of nigral cells for more than one million American Parkinson's patients.

But the use of stem cells has raised many questions and stimulated much debate in recent years. How do different kinds of stem cells compare? What are the scientific challenges, ethical implications, and political realities that complicate proposed research? And what medical progress has already been made? In *The Stem Cell Controversy*, a manageable but refreshingly balanced anthology, philosophers Michael Ruse and Christopher Pynes relay recent commentaries, official decrees, and, most important, expert analyses addressing each of these crucial issues.



The limitations of adult stem cells (ASCs) have been well documented by many, including the National Institutes of Health. ASCs are difficult to isolate and, in fact, have never been isolated in many tissue types. When located, they are often present only in small quantities, and they quickly lose the ability to divide and differentiate in cultures. ASCs are also more likely than embryonic stem cells (ESCs) to contain genetic errors or blemishes resulting from disease or the unavoidable hazards of daily living. And, although certain varieties of ASCs—bone-marrow and umbilical-cord blood stems in particular—might be more versatile than others, there is no evidence to suggest that any ASCs are pluripotent (capable of producing almost any type of cell in the human body).

But some of these concerns are largely unwarranted, argues neurobiologist Maureen Condic. That ASCs are difficult to locate and grow is a mere technical problem that science will likely solve given sufficient time and effort. The scarcity issue is trivial, because autologous transplants, involving stems extracted from one's own tissue, require fewer cells than would be necessary to treat groups of patients. Diseased donor tissues, as a practical matter, affect ASCs and ESCs equally, because injuries or foreign agents are responsible for most illnesses. On the other hand, genetically based diseases are not usually relevant, because they typically occur only later in life.

And, assuming the successful isolation, maintenance, and transplantation of sufficiently numerous ASCs, adds neurologist Sidney Houff, their proliferative limitations might actually offer clearly practical advantages. After all, as stem cells or more advanced progenitor cells become further differentiated, fewer things can go wrong. Prior commitment is an especially attractive attribute in the context of central-nervous-system cell

Kenneth W. Krause is a former prosecutor and criminal-defense attorney with degrees in law, history, literature, and fine art. The books editor for Secular Nation*, he has recently contributed to* Free Inquiry*,* Truth Seeker*, the* SKEPTICAL INQUIRER*,* The Humanist*, and* Skeptic *as well. He may be contacted at krausekc@msn.com.*

transplants where phenotype control is crucial. In addition, ASCs and progenitors are likely to be more responsive than ESCs to signals in niches, where stems typically reside. In fact, ESCs might require signals that are simply not available in adult tissues.

But ESCs are uniquely pluripotent, supplying scientists and patients with the greatest hope for wide-ranging success, everything else being equal. ESCs possess vast potential with respect to cell and tissue therapies, despite the very iniquitous menaces of immune rejection and teratoma formation. But they can also help us to better understand the processes by which the most perilous diseases—cancers and birth defects, for example—are created. In other words, a more sophisticated comprehension of cellular activity at the executive level, and therefore of life itself, may hang in the balance.

But at what moral cost? Most people are familiar with the standard permissive argument—generally, that the barely visible, 150-cell blastocysts from which inner cell masses and ESCs are extracted do not display the attributes of personhood. But philosopher Don Marquis finds this position ethically dubious, even from a purportedly objective and nonreligious perspective. Moral agency, for example, cannot be the standard, because neither infants nor the mentally retarded can be considered moral agents. Sentience and consciousness cannot be considered elemental to personhood either, because every person drifts into unconsciousness, albeit temporary, on a regular basis—during sleep. ESC research, Marquis concludes, is nothing more than age discrimination.

Bioethicists Glenn McGee and Arthur Caplan attempt to address the typically conservative theological argument—that installation of the human essence (or soul) occurs at conception and that the destruction of a human embryo necessarily results in the destruction of its human essence. If only for the sake of argument, McGee and Caplan grant blastocysts personhood. They point out, however, that only the replaceable and relatively non-descript parts of the early embryo—the cytoplasm, the cell wall, and mitochondria—are destroyed in the process of stem-cell production. The truly human feature of the blastocyst, the recombined DNA of each parent, is not destroyed. This is quite significant in the context of in-vitro fertilization (IVF) procedures, in which embryos are slated for destruction from the very beginning, and it becomes even more significant at the point when we can harvest DNA from stem-cell lines to create fresh, nuclear-transfer-derived embryos.

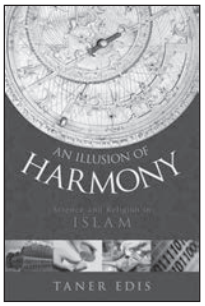
The use of stem cells has raised many questions and stimulated much debate in recent years.

Political scientist Simon Clark agrees, contending that contemporary German, Australian, and American stem-cell policies, essentially confining the use of ESCs to those currently in existence, are inconsistent with these countries' policies allowing infertile couples to take advantage of IVF programs in order to have children. If we permit embryos to be destroyed for the purpose of procreation, why not for the purpose of saving lives? As a compromise, Clark proposes a national laissez-faire position permitting the creation of human embryos for the sake of research alone, but including compelling incentives for the accomplishment of the same goals by other, less controversial, means—perhaps in the form of financial incentives or tax breaks.

The research has just begun, of course, but certain successes furnish us with adequate grounds for continued optimism. Katty Kay and Mark Henderson report an experiment involving 120 mice and rats infected with a virus causing a paralyzing and generally incurable spinal disease. Following an injection of human ESCs, every rodent regained at least some mobility. Kay and Henderson add that the damage originally diagnosed in the animals was very similar to that which afflicts motor-neuron-disease sufferers, including Stephen Hawking. And CBS news correspondent Carol Marin describes the case of Keone Penn, a young boy with a particularly severe and painful case of sickle cell. Ineligible for a bone-marrow transplant, the standard treatment for someone in his condition, Keone was saved by an injection of stem cells derived from umbilical-cord blood.

Parkinson's patients are typically forced to endure frustrating stiffness and tremors. In advanced stages of the disease, they can suffer uncontrollable falls, incontinence, difficulty in swallowing, and even dementia. Patients might eventually require constant assistance or become bedridden. Experiments with mice, however, have proven that neural stem cells can effectively replace defective cells throughout the brain and, in some cases, correct the underlying problem. And now we have the ability to generate specific types of neural cells from ESCs. According to the National Bioethics Advisory Commission, these advances "hold much promise for the treatment of severe neurological disorders that today have no known cure."

Stem-cell reports continue to surface at an encouraging rate. Fully functional liver cells have been grown from stem-cells located, again, in umbilical cord blood. One scientist has coaxed human ESCs into retinal stems, 6 percent of which have grown into photoreceptor cells in the lab—great news for victims of macular degeneration. Researchers in Boston believe they have discovered a means of generating ESCs without destroying embryos. A group in Japan claims that it can create these cells without using an embryo in the first place. Perhaps it's only a matter of time. But no person, whether she considers herself a scientist, a politician, or a common citizen, should ever forget that, for many, time grows increasingly short.



Islam's Troubled Relationships with Science

HARRY EAGAR

An Illusion of Harmony: Science and Religion in Islam. By Taner Edis. Prometheus Books, Amherst, N.Y. 265 pp. Hardcover, $28.

In reading *An Illusion of Harmony: Science and Religion in Islam*, Taner Edis's exploration of Islam's attempt to reconcile its medieval worldview with science, readers of the SKEPTICAL INQUIRER will be especially interested in the way that the Muslims who have attempted to manage modernity skip right over the Enlightenment and often end up adopting an either antiscientific or completely scientistic modernism of the crankiest kinds.

However, the appeal of pseudoscience to revisionist Muslims is far from the whole story. Edis, not a Muslim but raised in Turkey, takes that supposedly most secular of Muslim nations as his test case.

First, he notes that Turkey may be an officially secular state, but it never became a secular society. Therefore, the task of intellectuals attracted to or repelled by the West was to "appropriate science without losing their cultural identity." However, "when European science began to take off, education and intellectual life in Muslim lands were completely dominated by orthodox scholars and sufi saints, neither of whom encouraged attention to knowledge that did not have an explicit religious purpose."

Far more so than in early modern Europe, sacred texts were and are beyond criticism in the Qur'an Belt. Thus, the task of intellectuals who perceived the practical power of science or technology was not to understand how science conformed to physical reality but to make up a "science" that conformed to scripture.

The incentive was to regain power: "Modern Muslim history is one of constant humiliation," in the view of the poet Mehmet Akif. The result was that, trying and failing to find an orthodox Muslim science, those Muslims who did not self-consciously return to primitivism turned to engineering rather than open research. That saved them from the dangers of free inquiry, but this cookbook approach ensured that Muslims seldom understood the tools they had borrowed—whether medicine or weapons—and when they used them alongside or in opposition to Westerners, they still came in second.

Via a well-known process of magical thinking, they migrated toward quackery in response. Thus, Islam produces a Said Nursi, "who advocated science, [but] thought he had disproved causality."

Edis, a prolific writer on issues of concern to the Center for Inquiry (like *Why Intelligent Design Fails: A Scientific Critique of the New Creationism,* written with Matt Young), reviews a wide range of Islamic approaches to science and considers them all failures—illusions of harmony.

As a result, pseudoscience is rife, even among the outwardly interested and sophisticated segments of Islam. As Edis notes, the same can be said of Western society. But "crack-pottery" has a different quality in Islam. For one thing, it is often associated with anti-Semitism.

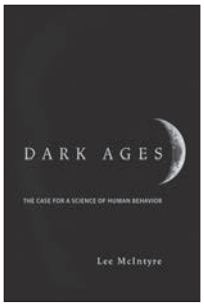
Pseudoscience is rife, even among the outwardly interested and sophisticated segments of Islam. It is often associated with anti-Semitism.

Edis concludes that liberalizing tendencies among Muslims, as far as they might have created an opening for a genuine science, have failed. He then contemplates the possibility that "fundamentalism could inadvertently create conditions more hospitable for doubt and skeptical inquiry. . . . For this to happen, however, fundamentalism must fail."

It seems a slender hope that revulsion would lead to a modernist revolution, but as a scientist himself (a teacher of physics at Truman State University), Edis would like to see real science become part of Muslim societies.

An Illusion of Harmony is probably

Harry Eagar is a staff writer at The Maui News, *Maui, Hawaii.*



A Call to Be Heeded

PETER LAMAL

Dark Ages: The Case for a Science of Human Behavior. By Lee McIntyre. The MIT Press, Cambridge, Massachusetts, 2006. ISBN-10:0-262-13469-1. 144 pp. Hardcover, $16.47.

Dark Ages: The Case for a Science of Human Behavior is a contemporary book for the general reader about the possibility of—and need for—a science of human behavior. This book is based on Lee McIntyre's *Laws and Explanation in the Social Sciences: Defending a Science of Human Behavior.* McIntyre notes that in contrast to humans' enormous scientific and technological achievements and our success in understanding nature we have failed to understand ourselves. With respect to our ignorance about ourselves, the causes of our behavior, and how to solve the important social problems that confront us, we live in what will some day be thought of as the Dark Ages. Our only hope is a "genuine science of human behavior" (p. 15). The development of that science, says McIntyre, is the greatest intellectual challenge that has ever faced humankind.

There is strong resistance to the development of a science of human behavior because such a science might threaten strongly held religious and political beliefs. The resistance is ideological, and the social sciences are of no help. There are a few social scientists who have done good empirical work and who are as disgusted with our present ignorance about social matters as he is, says McIntyre. But their work has been ignored or underpublicized. Most social scientists have misunderstood or ignored the true nature of scientific inquiry, which requires that hypotheses be empirically testable so that erroneous assertions can be weeded out—the Popperian falsifiability criterion.

One example of poor social science research is that concerned with the debate over the relationship between immigration and welfare. Are immigrants more likely than the native-born to be on welfare? The politicization of this debate has prevented the emergence of an agreed-upon answer. As with so many other social science issues, researchers and the public can find evidence to confirm whatever hypothesis they bring to the debate as long as they cling to their ideological and methodological assumptions. Social science uses evidence, but the way it uses it is "too infected with ideology" (p. 25) to constitute a genuinely scientific understanding of human behavior.

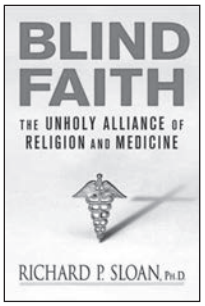
A science of human behavior might threaten strongly held religious and political beliefs.

McIntyre briefly describes five common objections to the possibility of a science of human behavior, for example that the subject matter of social science is prohibitively complex, that it is impossible for us to be objective about our own behavior, and that humans have free will. He then refutes each objection. He also considers what social science can learn from natural science's historical struggles with ideological resistance to knowledge. Citing figures such as Hitler and Stalin, some fear that a science of human behavior may be used for evil. But the pseudosciences those figures (and others who attempted to misuse science to further their ideological agendas) embraced can best be defeated by ensuring that we understand the true nature of scientific reasoning. Scientific reasoning, says McIntyre, is not a set of rules or procedures or even a particular method. Rather, it is "an attitude that one takes toward the revision of a theory in the light of empirical evidence" (p.107). And the way to avoid tyranny by those who claim to know our real human nature is for scientific knowledge about our behavior to be widely disseminated.

In a book devoted to the need for a science of human behavior it was quite disappointing to come across no reference to, much less discussion of, the discipline of behavioral analysis. A founding father of the field, B. F. Skinner, titled his seminal 1953 book *Science and Human Behavior* and continued his advocacy of a science of human behavior with *Beyond Freedom and Dignity* and *About Behaviorism.* But the work of behavior analysts has been, when not ignored or underpublicized, sometimes viciously mischaracterized (see, for example, "Skepticism of Caricatures," SI, January/February 2004, and "A Response to Myths about Reinforcement," SI, July/August 2004). McIntyre is also unwarrantedly optimistic about what a science of human behavior could accomplish, for example, in preventing crime. He is also somewhat repetitious.

I applaud McIntyre's call for a science of human behavior, as we demonstrably desperately need one. When individuals make assertions about social problems, I often ask, "How do you know that?" The response to my question often makes it clear that their assertions are

Peter Lamal is emeritus professor of psychology, University of North Carolina, Charlotte.



Why Religion and Medicine Don't Mix

KENNETH W. KRAUSE

Blind Faith: The Unholy Alliance of Religion and Medicine. By Richard P. Sloan. St. Martin's Press, New York, 2006. ISBN 0-312-34881-9, 295 pp. Cloth, 25.95.

Dissatisfied with outrageous fees, insensitive bureaucracies, and effectively victimized by a pandering, uncritical mainstream media, an increasingly sentimental and scientifically illiterate American public has embraced faith as a supplement to—if not as a substitute for—empirically based health care. In *Blind Faith*, Columbia University professor of behavioral medicine Richard Sloan investigates the credibility of alleged links between religion and medicine and opines that the joining of faith and science has affected the integrity of each. Sloan's theological assessments are unhelpful. His forays into medical ethics are relevant, but infected with an acute—probably chronic—case of professional arrogance. More impressive are the professor's presentations and critiques of the pertinent studies.

Sloan scrutinizes the two compilations most frequently cited by supporters of religiously infused medicine. In 2000, Frederic Luskin reviewed twelve papers on cardiovascular disease in the *Journal of Cardiopulmonary Medicine*, claiming that "evidence continues to mount that demonstrates the positive value of spiritual and religious factors in maintaining health." Of those twelve papers, two pertained to denominational distinctions, one merely summarized a project, and another simply reviewed other studies. The first four, in other words, were either inadequately detailed or irrelevant to the stated issue altogether.

Two of the remaining eight papers failed to correct for what researchers pejoratively refer to as "multiple comparisons." In order to distinguish between a statistically significant or "real" finding and a "chance" finding, scientists have established the 5 percent standard. A result is deemed real, in other words, if it would occur by chance less than 5 percent of the time. For example, if a coin were tossed four times and came up heads in each instance, we would conclude that it did so by chance because the statistical probability of that outcome is 6.25 percent. But if a coin were tossed five times instead, and came up heads each time, we would reject chance as an explanation because that result's probability is only 3.13 percent. We would conclude that the second coin was fixed. If one were to continue flipping perfectly legitimate coins, however, eventually she would get five heads in a row because multiple tests lower the scientific standard and increase the likelihood of mistaking a chance result for a real finding.

Sloan identifies a paper by Harold Koenig and colleagues as one of the two that violated the multiple comparisons standard. Purportedly finding differences in blood pressures between religiously involved and uninvolved persons, Koenig's team made at least 126 different medical comparisons, only a few of which were ultimately (and erroneously) deemed significant. Koenig could have corrected for the breach simply by multiplying the 5 percent standard by the number of comparisons his team made, but he didn't. Though likely the products of chance alone, Sloan concludes, it is not at all surprising that a few among the 126 results at least appeared significant to persons caught unaware of the research standard and its purpose.

Luskin reviewed two more studies relating to the effect of religious activity on blood pressure. One paper reported comparatively low diastolic, but not systolic, blood pressure among subjects declaring greater frequencies of attendance at religious services. The second study found reduced systolic, but not diastolic, pressure among members of a similar group. Obviously, both reports can't be right. And neither research group controlled for the subjects' prior health. If they had been ill before the experiment, for example, they would have been more likely to have high blood pressure and less likely to be able to attend church.

Of the remaining four, one paper examined religiosity's effect on patient recovery time following coronary artery bypass surgery. The problem here was that the researchers failed to consider even the most obvious potentially confounding factors, including other health indicators such as smoking and high blood pressure, or relevant social variables like marital status. A similar study on bypass patients attempted to associate lack of religiosity with mortality. Its strength was that it considered at least some potential confounders. Its fatal weakness, however, was that it focused upon a single religiosity factor, reported "comfort from religion," among a total of five studied. Once again, a supposedly scientific inquiry failed to correct for multiple comparisons. A third paper, this time involving heart transplant patients, reported just one significant finding among forty-two statistical tests. The final study included in Luskin's twelve suggested that religious coping

Kenneth W. Krause is a former prosecutor and criminal defense attorney with degrees in law, history, literature, and fine art. Books editor for Secular Nation, he has recently contributed to Free Inquiry, *SKEPTICAL INQUIRER,* Truth Seeker, The Humanist, *and* Skeptic *as well. He may be contacted at krausekc@msn.com.*

was protective. But according to Sloan, there was nothing at all about protection in the paper.

Next, the author critiques eighty-nine cardiovascular health reports contained in the second popular compilation, Koenig's 2001 *Handbook of Religion and Medicine*. Sloan dismisses many of these studies for familiar reasons. Thirty-three based conclusions on denominational differences, fourteen simply abstracted, reviewed, or described other projects, and eight drew no connections whatever between religious activity and health. Others made uncorrected multiple comparisons, and some involved inadequate or nonexistent control groups. One weight-control program had nothing to do with religion, but was apparently included because it was conducted in a church. Three studies admitted to unearthing not one statistically significant effect. Another paper—written by Koenig himself—contained findings directly opposed to the predicted result. Although its authors continue to represent the *Handbook* as a definitive and affirmative examination of the relevant literature, according to Sloan, what the book accomplishes "is to show us definitively how incredibly weak the evidence actually is" (p.137).

For an evaluation of claims regarding religion's general health benefits, Sloan briefly hands the reins over to Lynda Powell and colleagues who reviewed the pertinent literature and, in 2003, published their findings in the *American Psychologist*. After weeding out methodological disasters of the aforementioned variety, Powell examined the remaining evidence relevant to nine different hypotheses. Two results predominated. First, of the nine claims, Powell found four to be "consistent failures." She discerned no reason to believe that religion or spirituality protected against death or disability, slowed the progression of cancer, or improved recoveries from acute illnesses. Second, however, Powell found "persuasive" evidence (meaning that there existed at least three supportive studies without serious methodological flaws or five supportive studies that were, at a minimum, generally sound) suggesting that consistent religious service attendance protected against mortality.

But Sloan remains skeptical for three compelling reasons. First, the association between church attendance and relatively elevated survival rates might not be causal. Projects based on religious beliefs and practices, unfortunately, must rely on observational studies where researchers cannot select participants and randomly assign them to groups according to the variable of interest. Proper clinical studies, involving randomly selected treatment and control groups, simply cannot be accomplished in these contexts. The trouble here is that subjects who self-select make it difficult for researchers to identify confounders. In other words, religious attendees might well differ from their nonattending counterparts in very important ways. For example, Sloan suggests, people who are depressed, live alone, or are already ill might tend to stay home. Although researchers can always attempt to control for such factors, they can never be sure that they have anticipated them all.

Second, because such studies are mostly conducted by interview, they are susceptible to self-presentation biases. People tend to present themselves in the best possible light, and at least some will embellish their observance of socially accepted norms, especially during impersonal telephone interviews. Studies devoted specifically to such interview methods estimate attendance reports to be over-represented by as much as 33 percent. Third, Sloan raises the issue of construct validity, arguing that church attendance is often unreflective of actual religious devotion. That the vast majority of churchgoers know little about their traditions' histories or theologies seems to cut deeply in Sloan's favor here. The author appears to contend, quite convincingly, that no matter the result any study attempting to link health to religiosity is doomed from the start.

Somewhat more credible are controlled evaluations of long-distance intercessory prayer (IP), where numerous patients are randomly and unwittingly assigned to one or more treatment or control group. Sometimes subjects are treated in a variety of ways, as occurred in the MANTRA (Monitoring and Actualization of Noetic Training) and the MANTRA II studies, published by Mitchell Krucoff and others in 2001 and 2005. In the pilot program, 150 acute coronary patients undergoing angioplasty were selected to receive one of five treatments: imagery, stress relaxation, touch therapy, IP, or standard care. The results of MANTRA yielded not one single statistically significant difference. Nevertheless, Krucoff initiated a larger evaluation. MANTRA II, designed as the definitive study on IP and published in *The Lancet*, randomized 748 angioplasty or cardiac catheterization patients to one of four treatments: standard care, IP, MIT (a combination of music, guided imagery, and touch), and IP plus MIT. Again, the outcomes demonstrated that IP had no effect. Finally, in 2006, Harvard's Herbert Benson published the $2.4 million Study of the Therapeutic Effects of Intercessory Prayer (STEP) in *The American Heart Journal*. A total of 1,802 patients recovering from coronary-artery bypass surgery were randomized into one of three groups: those who unknowingly received prayer (from three mainstream religious groups), those who unknowingly did not, and those who knew they would receive prayer. Either way, the prayers had no effect.

But what if the results had been different, somehow indicating religiosity's positive affect on health outcomes? Should physicians inform and advise their patients accordingly? Not if they intend to practice medicine ethically, warns Sloan. Armed with such dangerous facts, the author vies, some patients would harm themselves, concluding that religion alone would protect them

from disease. And because regular folks may be incapable of seeing doctors as anything but intimidating authority figures, patients might feel coerced when making personal decisions. Better they should remain ignorant. So why write a science book for these poor, wretched creatures? In the end, Sloan robs his readers of the rationality and responsibility he initially presumed them to possess—as if their megalomaniacal physicians hadn't already performed that valuable (and expensive) service.

Vaughn uses makes this textbook suitable for high school and higher education classes. The book covers its material using methods backed up by recent experiments in cognitive learning.

There are six lessons in human cognition that teachers should be aware of when dealing with critical thinking skills:

1) Critical thinking is hard. Most students have difficulty with general reasoning and argumentation. One explanation is that we are simply not hard-wired for this approach.

2) Practice makes perfect. Critical thinking can be learned, but only through extensive practice. Students must be presented with a "panning for gold" approach rather than rote learning of theory.

3) Critical thinking is usually thought of as a general skill; most have trouble transferring critical thinking skills to other subjects.

4) Practical theory is necessary; reliance strictly on learning theory leads to failure.

5) Diagramming arguments is an extremely effective tool if used with a verbal approach.

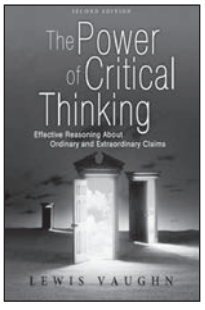
6) Of all the cognitive biases discussed in rational and critical thinking discourse, belief preservation may be the hardest to overcome.

Textbooks and instructors must stress the need for students to heavily weigh new, contrary evidence and present their findings in verbal and written exercises.

Vaughn's book addresses each of these problems through its thorough presentation of critical thinking skills and exercises. His use of colored text boxes, examples directly related to issues likely to be of interest to students, cartoons, reminders, and summaries make its approach fun for students. Each chapter contains field problems, self-assessment quizzes, integrative and critical thinking and writing exercises.

There are two potential difficulties with Vaughn's approach. One is the scope and sheer number of verbal and written exercises presented in each chapter. They may intimidate both students and teachers, turning them off to the subject. The second is the teaching methods used with this textbook. There is disagreement among scholars as to the approach instructors should take when teaching critical thinking skills. Some are generalists, who believe critical thinking is a universal, general skill. Others are specifists, who see critical thinking as only a loose category of thought that should be taught in a subject-specific course. If used by an instructor associated with a generalist view of teaching, it may be too broad to be an effective tool. If used as a developmental approach to teaching critical thinking, it can be an effective addition to a class in any social science discipline.

Vaughn has succeeded in providing a comprehensive, effective, and accessible approach to critical thinking. It is a timely, modern approach in line with recent studies demonstrating why people have so much trouble thinking critically. This text is highly recommended and suitable for use in secondary educational curricula. □



An Effective, Positive Approach to Teaching Critical Thinking

DAVID W. CLAPSADDLE

The Power of Critical Thinking: Effective Reasoning about Ordinary and Extraordinary Claims. By Lewis Vaughn. Oxford University Press, New York, 2005. ISBN 0-19-516142-4. 502 pp. Softcover, $25.

Despite the consensus that critical thinking needs to be taught more effectively at all educational levels, there is little agreement on what critical thinking is or how it should be taught. Given the renewed importance attached to the teaching of critical thinking skills, a new approach is clearly needed. In *Power of Critical Thinking, Effective Reasoning About Ordinary and Extraordinary Claims*, Lewis Vaughn provides a new approach as he successfully fills the void left by other textbooks on the subject. It is written much in the same style as his previous books on related subjects: *How to Think about Weird Things* (2004), *The Case for Humanism* (2003), and *Science Meets Alternative Medicine* (2000).

The scope and scale of how he presents the learning of critical thinking skills is presented comprehensively and effectively. The wide range of exercises

David Clapsaddle is a doctoral student in Public Affairs at the University of Nevada, Las Vegas.

FORUM

Why I Burned a Bible

JOE SZIMHART

The day that my issue of the SKEPTICAL INQUIRER titled "Science, God, and *(Non)*Belief" (March/April 2007) arrived, I burned a Christian Bible. This cover of SI is provocative. Street signs show the intersection of Science and Religion. The position of the signs begs the question: is there an intersection of science and religion? For some of us, it seems so, and we live at that intersection—if not smack in the middle of the unruly traffic. Are there any stop signs here? Is anyone governing the traffic? I hear horns blowing and tires squealing—sometimes culminating in sounds of crunching metal and breaking glass.

Some people associated with SI know me as a "cult expert" or "deprogrammer." Indeed, I made most of my living from 1986 through 1998 traveling from one intervention to another, here and abroad—many hundreds of encounters to try to persuade someone to reconsider devotion to controversial persons, ideologies, objects, or cult formations. I still do that kind of work part-time. My full-time job is less controversial. That brings me to why I burned a Bible.

Before a religious atheist might applaud my action or a fundamentalist evangelical raise his fist in alarm, let me pause here to put up a stop sign or two. I am a Catholic of the practicing variety, and I burned a Gideon's Bible typical of the translations used by many Protestant sects. To destroy the Bible, I used a fifty-five-gallon incinerator drum behind my sister's house in Boyertown, Pennsylvania. I tore the book up and lit a match and watched it burn to ashes. Now, why would I burn that book?

Joe Szimhart is a cult-information consultant in Douglassville, Pennsylvania. E-mail: jszimhart@dejazzd.com.

I work in the intake area of a mental hospital. The patients who come in—whether willingly or against their will—are generally at their worst. An apparently angry but psychotic man ruined the binding on a Bible he had and he threw it in the trash. My boss retrieved it because she is a Christian and felt the book deserved more respect. I volunteered to get rid of it properly. On my way to my sister's house, I stopped by our church to drop off the "blessed" palm fronds that the church burns to make ashes for the Ash Wednesday ritual. I asked a priest what to do with a ruined Protestant bible. Technically, the Gideon, not having been blessed by a priest, is not "sacred" and therefore can be trashed like any other ruined book. Catholics should burn ruined or outdated blessed objects like the Easter fronds. The priest, a reasonable man, recommended I incinerate the Gideon out of respect anyway.

What can this mean to a skeptic? There is no available evidence that I actually burned that Bible, unless, of course, you create a *CSI* television skit showing how marvelously science can track that very object from mere ashes! Does it really matter if an object is blessed or not? The priest knew that there is no measurable or empirical evidence that throwing a blessed object in the trash changes anything in the physical universe more than throwing an unblessed one away. It boils—or should I say *burns*—down to moral choice, psycho-spiritual orientation, and to what remains after all the evidence fails to prove or disprove sanctity. Perhaps the illustrious Isaac Newton, an avid if closeted alchemist, did not realize this, but what remains is the inevitable dross or *nigredo* at the bottom of an alchemist's metaphorical crucible. It is the "stuff" from which comes the philosopher's stone, that same stuff that enriches the soul. It is the *nothing* from which all that is moral or aesthetically pleasing to mankind arises. It is what we choose to do that is right or appropriate and respectful, despite the lack of scientific reason to do so. The same stuff impels a scientist to be honest, not jealous, with his data.

What I really want to talk about at this intersection between science and religion is less esoteric. In fact, it is downright prosaic and pedestrian. My job as a deprogrammer (the more polite term is *exit counselor*) is to persuade someone to regard information that could change his or her certainty about something or someone. I use as much reason, science, history, and theology as I can muster and appropriately apply. I try to tap into my client's inherent sense of reason and morality.

Invariably, if I am successful in my struggle, the client will ask me, "What is the truth then?" He or she assumes, "If you can prove that the truth is not this, then you must know what the truth is." Here is where I have to be careful. What I do is let them know that they are asking the wrong questions—the very questions that got them into a cult mess to begin with. Who am I? Where am I going? What is life all about? Where does it all come from? Why am I here? Any slick guru—of science *or* religion—has answers for those questions, but a reasonable guru, one who keeps you sane and socially viable, will help you to refine your questions and to live well socially.

I am not saying that we can get along with everyone at the intersection.

I would have to be insane to think I could, even if I wanted to, which I do not. Some folks and groups require confrontation. There is a way, however, to avoid the rigid, straight-line thinking that I find so often in cults that form in religious, political, scientific, and any other variety of social circle. Science and religion will certainly continue to cross, as long as we have birth, death, and infinity to ponder.

Maybe the SI cover should have illustrated one of those New Jersey circles with a traffic island. I imagine this as an island of reason where I like to stand when observing the flow of ideas, wherever they come from. Fundamentalists and atheists can continue to toot horns as long as they do not run us over. Deafened is better than dead. Of course, they can chase each other as fast as they can go round and round. That takes skill and endurance, if nothing else, but, as reasonable men, they will avoid endless circular arguments. Anyway, this island metaphor, like all metaphors, wears out, so I will leave it.

You are probably thinking, what is he getting at here? The articles in this SI got me thinking about the polarization that creates animosity and confrontation. People can get crazy with emotion when debating the truth. In fact, they can get quite like some of the folks I deal with at the mental hospital, so fixated with certainty that a reasonable relationship with people and the environment collapses. I have to commend SI for another fascinating issue and one that promotes reasonable debate. However, if it is reason that best affords humanity a way to live well, then reason should do the same for religious life, as well. Early in the Christian tradition, St. Augustine thought so. Reasonable approaches to every faith help followers avoid the pitfalls of harmful cult behaviors.

As I live and work at this intersection, I appreciate the increasing traffic coming down the scientific road, and I can dispose of a ruined Bible reasonably well.

Getting It Right, or Brooklyn Is Not Expanding

RALPH ESTLING

I notice that people tend to go to extremes. This is most likely to occur when they don't understand something.

Now, the point I'd like to make is this: the fact that we don't comprehend something doesn't necessarily mean that the thing is absurd. *Or* profound. Our mere lack of comprehension should not cause us either to dismiss it out of hand or to think that it must be wonderfully brilliant. This is a somewhat obvious cautionary reminder, but people have a tendency to view ideas and other things they don't quite understand as being at one of these two extremes. For example, an awful lot of total nonsense has been written by cultural relativists about there being no such thing as objective truth, that truth is nothing but a mere cultural artifact, a social creation and convention, and that goes for science and all other values of all descriptions about everything. Postmodern philosophers write incredible rubbish about science, about art, about literature, about anything that comes to mind, and the intellectually chic and with-it lap it up, because they've decided it must be very profound stuff if *they* can't fathom it. (Of course they don't *say* they can't fathom it.) And if our pretensions go the other way, if our intellectual posturings respond in the alternative direction, we decide that if *we*, in all our glorious and majestic wisdom, can't understand something, it must, ipso facto and slam dunk, not be worth our time and effort to try. Both attitudes, both posturings, are self-destructive of intellect. Both should be avoided like the plague.

It's not easy to do this, to keep our minds open and at the same time know when to slam them shut, to know what is very possible, what is vaguely plausible, and what is total crap. Naturally, the more we know about the subject, the more likely it is that we won't come to ridiculous conclusions about it. But there's no ironclad guarantee about that. Very knowledgeable people have come to very wrong and even stupid conclusions about all manner of things throughout human history, even before Aristotle, one of the most intelligent human beings who ever lived and who came to all kinds of wrong conclusions. And then there was his teacher, Plato, who has confused more people about more things over more time than anyone else who ever lived. So it isn't that the experts are necessarily stupid (not [redacted]

Ralph Estling writes from Ilminster, Somerset, England.

lack enough detailed knowledge and therefore the ability (often through no fault of their own—Newton would have profited by having knowledge of special and general relativity but can hardly be blamed for this failure) to use that knowledge properly, to work out, interpret what facts they do have in the right way, because the facts they *don't* have and maybe can't possibly have preclude this. Added to this is the likelihood that they can't possibly know precisely what facts they are lacking. Generally, no one can be blamed, but that shouldn't prevent us from bearing this problem in mind the next time an expert tells us something based on his expertise. More worryingly, there are many occasions when the experts *can* be and *should* be blamed, even scientific ones. Witness the Bogdanov brothers, proclaimed as geniuses by one set of physics experts and as makers of absolute rubbish by another set of physics experts.

And then there is the case of an undisputed genius.

While working on the mathematics of his general theory, Einstein discovered to his surprise that, according to his calculations, the universe wasn't static but must be expanding or contracting. But all the experts *knew* the universe was static, and so Einstein, who was no expert in astronomy, bowed to their superior expertise and forced himself to invent a get-out clause, the Cosmological Constant, an ad hoc, arbitrary force by which the universe stayed the same size forever by counteracting gravity. A few years later, when Friedmann in Russia and Hubble in California showed that the universe *was* expanding, Einstein sighed *oy veh* and called his Constant the biggest blunder in his life: he had discovered that the universe was increasing in volume and threw this immensely important discovery away in order to, as the saying goes, "save the appearances" rather than have faith in what his equations told him, whatever the experts said.[1]

And just to show that there is irony within irony, over the last twenty years or so, several cosmologists have re-thought the Cosmological Constant and decided that it, or something very much like it, may well be required after all, and they call it "dark energy," "vacuum energy," "lambda," "quintessence," and one or two other things that I can't recall at the moment. I guess it shows that we shouldn't be too quick to jump. And it also shows that we shouldn't be too slow to jump. This is the celebrated Goldilocks Principle, finding Baby Bear's chair, porridge, and bed not too hard, not too soft, not too hot, not too cold, but just right. Easy to talk about, not so easy to put into effect, especially when you don't know everything, which is always the case, even with experts. For example, a slight problem still remains with vacuum energy, the "dark energy" of so-called empty space. According to the arithmetic, the amount of this energy exceeds the amount that has been actually observed by a factor of 10^{123}—that is to say, 1 followed by 123 noughts, a noticeable discrepancy. (To be fair to the physicists, I've come across other, lower estimates, the lowest discrepancy being merely 10^{56}.)

It gets worse. Some physicists have begun challenging long-held shibboleths about the "constants" of nature, like gravity's strength, light's velocity, the ratio between the proton's mass and that of the electron, and the "fine-structure constant," which governs the interaction of light and electrons. These soi-distant constants vary over time, they proclaim. Other physicists hotly reject this blasphemy, this shattering of physics' holy-of-holies.

So, what is the point of all this? The point is that a balance must be struck so that nonestablishment science ideas are given a public outing, while nonscientific ideas masquerading as science are not allowed to get away with calling themselves science, or at least not get away with it without a big rumpus. Of course, the problem involves separating the sheep from the goats. Don't ask me for the magic formula of how you do this. All I know is that some funny scientific ideas are worth thinking about and worth going out looking for evidence for and against and some aren't. *You* work it out. I'm just the idea man. All I can say is that it involves balance.

Balancing things, one against the other, is always a good idea; it keeps us from being too credulous *or* too cocksure, believing whatever nonsense the experts dish out, just because we don't understand, or sneering an idea out of our contemptuous consideration, just because we don't understand.

And so, now I read that someone at the University of Ulm has decided that the universe is shaped like a trumpet—not the modern sort that curls around and has valves but like the old-fashioned kind that blew fanfares and flourishes, and has a straight tube that flares out into negative curvature, like a Pringle potato chip, at one end and, at the other, just tapers down to a point—no mouthpiece, just a point—and beyond the point, nothing.

I'm writing this well after breakfast but I'm still not able to believe in six impossible things. And then I think: is this just the wise old skepticism of a wise old man who has heard it all before? Or is it just the arrogance of ignorance? I'm not sure. But I feel vaguely worried. And then I ask a God I don't believe in to let me learn a whole lot more than I know now, or think I know now. So that I won't run the risk of being too clever by half, or too stupid by a hundredfold.

Because, when you stop to think about it, this is an utterly incredible, marvelous universe we inhabit. We shouldn't worship it, but we should, I think, be awestruck by it and learn as much as we can about it, as a sort of tribute to it. And be grateful that we have had the opportunity to become, if only for a little while, acquainted with some small part of it.

And what a rare and extraordinary privilege to be part of it. Think (as well as you can) of all the possible beings, all the life-forms, conscious or not, that might have existed since the dawn of

time (if time had a dawn) but never got the opportunity to exist because, as bad luck and circumstance dictated, Darwinian natural selection and accident ruled them out, through no fault of their own. Yet, somehow, for reasons we cannot begin to understand, *we* have existed, *we* have occupied time and space. And, what's more, been granted brains to use, if we choose to. Incredible. Wondrous. Miraculous.

And so you wonder why on earth—or anywhere—beings supplied with a brain need gods and their miracles and the whole shebang, the whose paraphernalia of the paranormal and the supernatural and all the rest of that malarkey, in order to feel amazed with the way things are.

You got to laugh, you really got to laugh.

Note

1. Woody Allen vividly describes his trauma when, as a teenager, he first learned that the universe was expanding. He thought this meant that everything else, including Brooklyn, was expanding, too. His mother had to inform him firmly that Brooklyn was not expanding and he should eat his supper. Like all Jewish mothers, she was

The PhD Degree and Biblical Fundamentalism

WILLIAM D. STANSFIELD

Is it appropriate to award a PhD degree in a natural science to a fundamentalist candidate who is committed to believing that explanations of scientifically gathered data must be made in agreement with a literal interpretation of the Bible? A specific example of this problem can be seen in my review of the book *Astronomy and the Bible* by Donald B. DeYongi, SI March/April 2007, p. 69, 71.

Historically, some very good science has been done by people of diverse religious beliefs with various degrees of commitment to the inerrancy of holy scriptures (e.g., Kepler, Newton, Galileo). Today, however, science deals with the material universe and naturalistic explanations thereof. Supernatural phenomena and explanations are considered outside the realm of science. Secular universities and peer-reviewed journals are unlikely to accept a PhD candidate's dissertation if it involves supernatural interpretations. A candidate may believe whatever she or he wishes about a supernatural world, as long as these beliefs are not used to explain or interpret scientifically gathered data.

Would it not be appropriate for a thesis committee to at least ask a PhD candidate to define her or his "philosophy" of science? Or has our experience with McCarthyism made us so sensitized that such a question would be akin to asking about a person's age, health problems, financial status, sexual preference, or political affiliation? What is wrong with asking the question "What do you believe to be the most productive way to learn about the material universe, and what is the rationale for your belief?" If the candidate believes that science is not that "way," then why is he or she pursuing an advanced degree and career in science? Would it not be hypocritical for a candidate to believe that the interpretation of data from scientific research should conform to the Bible (or other sacred documents) while striving to gain a degree in a field of study that has proscribed supernatural and religious input? What should a thesis committee, charged with passing judgment on the qualifications of candidates for a PhD degree in science, do with those whose commitments to science lie in philosophies that are antagonistic to the advancement and teaching of science? Should they do anything at all? How would financial aid sponsors for such candidates feel if they learned about the acceptance of their scholarships by a candidate whose philosophy is contrary to the interests of science? Is it right that a fundamentalist student takes one of the very limited enrollment positions in a PhD program, thereby depriving another serious student who is committed to advancing science by working entirely within its methodology, a chance to prove him- or herself? Of course, a candidate could lie about his or her personal convictions to deceive the people charged with screening applicants for a PhD program. Some candidates may consider that the end result justifies the means. Unfortunately, there seems to be little that can be done to circumvent this possibility. Nor is it possible to prevent a person who earned a PhD without fundamentalists beliefs from later changing her or his philosophical view regarding science.

Educational institutions sponsored by religious groups understandably might prefer to employ teachers with fundamentalist beliefs, especially if they have obtained a PhD in a natural science from a secular university, because of the prestige

William D. Stansfield is emeritus professor, Biological Sciences Department, California Polytechnic State University, San Luis Obispo, CA 93407. E-mail: wstansfi@calpoly.edu.

that would accrue to the hiring school. Furthermore, if such a teacher authors one or more "science" books espousing his or her religious beliefs, his or her PhD degree would likely enhance the sales and acceptance of these publications by potential readers. Many publishing houses are devoted to sponsoring and promulgating such works. The influence such authors could have among the general public might potentially spread far beyond the classrooms in which they teach.

What about a fundamentalist PhD that enters the secular academic world and becomes privileged to teach science classes? Will the teacher be allowed to abuse her or his academic freedom of speech by philosophizing about unscientific ways of explaining the physical universe in science classes? Where in the pipeline from a candidate's entry into the PhD program to her or his graduation and teaching appointment, in a public-supported school, is there any oversight or regulation? If basic philosophies do not matter, what does the academic title PhD represent? I fear that as long as educational systems continue to avoid addressing these concerns, students being taught "science" by fundamentalist teachers are at risk of (among other things) being confused about the boundaries of science and the methods whereby scientific knowledge is gained. Let freedom ring, but let it ring in the right places.

The Two-Months Argument for Parapsychological Research

JESPER JERKERT

In the perennial debate between parapsychologists and critics, some arguments are recycled in a seemingly endless fashion, whereas others pop up suddenly and then gradually fade into oblivion. One of those pop-up arguments is the *two-months argument* (TMA, for short), which dates back to a 1993 paper by Sybo A. Schouten. TMA goes like this: ". . . the entire investment (during the last one-hundred years) in parapsychological research in the United States is equivalent to less than two months' research in psychology in 1983." By "investment," Schouten mainly referred to human resources, but he also assumed that research facilities for individual researchers were more or less equal for parapsychology and "ordinary" psychology. Therefore, TMA has been invoked to support not only the thesis that parapsychology is still a young science but also the thesis that parapsychology is underfunded.

Jesper Jerkert is the chairperson of the Swedish Skeptics (Vetenskap och Folkbildning), founded in 1982, which has a current membership of 2,100. The organization's Web site can be found at www.vof.se.

Immediately in 1993, Charles Honorton began the use of TMA against skeptics. Statistician Jessica Utts invoked TMA in the famous 1995 debate with Ray Hyman over the U.S. government's two-decade psychic-research program. And, even today, TMA has not yet faded away. As recently as 2006, I asked what psi really *is*, and parapsychologist Adrian Parker replied, "Is it reasonable to expect an answer after two months of research?" TMA has a fair chance of becoming one of those ever-recycled excuses in the debate over psi.

Such a status, though, would be unwarranted. Although I do not question Schouten's calculations, the widespread use of TMA is doubtful for several reasons.

First, it seems disproportionate to compare parapsychology with all branches of psychology put together. Many similar comparisons could be made without any clear implications. For example, we could compare similar investments in music acoustics during the last one hundred years with investments in all other acoustical fields. Perhaps that would yield a two-months figure too. So? The calculation would not automatically imply that music acoustics is underfunded or that it is a young science. Such claims would require more elaborate arguments. Thus, my main objection against TMA is simply that it does not show that parapsychology is young or underfunded. The conclusion is a *non sequitur*.

This is enough to dismiss TMA as a valid excuse for parapsychology's lack of evidence, but I wish to point out yet another problem. TMA is about human investments and money, but it substitutes those resources for time, as if they were convertible without further ado. They are not.

TMA says this: if you take all money historically granted to parapsychological research since the 1880s and spend it today on all researchers working in parallel within "ordinary" psychological science, the money would run short in two months. Sure, but, in reality, no

FILL IN THE GAPS IN YOUR Skeptical Inquirer COLLECTION

• 15% discount on orders of $100 or more •

• $6.25 a copy, Vols. 1–18 ($5.00 Vols. 19–25). To order, use reply card insert •

MAY/JUNE 2007 (vol. 31, no. 3): Global climate change triggered by global warming, part 1, *Jordan* / Danger! Scientific inquiry hazard, *Scott* / Theatre of science, *Wiseman* / The myth of consistent skepticism: the cautionary case of Albert Einstein, *Riniolo and Nisbet* / PEAR lab closes, ending decades of psychic research, *Jeffers* / Snake-oil traders, *Ernst* / Third strike for Columbia University prayer study: Author plagiarism, *Flamm* / Special Report: Secrets and lies, *Carmichael and Radford* / Deciphering Da Vinci's *real* codes, *Nickell*.

MARCH/APRIL 2007 (vol. 31, no. 2): Special issue: Science, God, and *(Non)*Belief: Special Report: A free-for-all on science and religion, *Johnson* / Follies of the wise, *Crews* / The religion blues, *Foster* / The clash of biotechnology and post-Christian spirituality, *Silver* / Fighting the fundamentalists: Chamberlain or Churchill?, *Ruse* / Thank goodness!, *Dennett* / Science's vast cosmic perspective eludes religion, *Sagan* / The Coulter hoax, *Olofsson* / Prayer, a neurological inquiry, *Haas* / Bible stories, *Mazur* / Old-time religion, old-time language, *Newbrook* / Special Report: Sci Fi Investigates, finds only pseudoscience, *Radford* / Mysterious entities of the Pacific Northwest, part 2, *Nickell*.

JANUARY/FEBRUARY 2007 (vol. 31, no. 1): Man for the cosmos: Carl Sagan's life and legacy as scientist, teacher, and skeptic, *Morrison* / Do they have your numb3r?, *Frazier* / The "vise strategy" undone, *Forrest* / Strange visions, *Catania* / Pep talk, *Baarschers* / Mass hysteria at Starpoint High, *Bartholomew* and *Radford* / Special Report: World Trade Center illness: Manufactured mass hysteria, *Fumento* / Special Report: New report casts doubt on Gulf War Syndrome, *Radford* / Mysterious entities of the Pacific Northwest, part 1, *Nickell*.

NOVEMBER/DECEMBER 2006 (vol. 30, no. 6): Special issue: Science + Art: The humanities and human nature, *Pinker* / Why we read fiction, *Zunshine* / View masters, *Livingstone and Conway* / Nature is nowhere rectangular, *Tufte* / String theory, *Pickover* / Sound: Not as simple as it sounds—An interview with Joshua Fineberg, *Dacey* / Creativity versus skepticism, *Ramachandran* / Special Report: Shame on shamus sham, *Nickell* / Siege of "little green men": The 1955 Kelly, Kentucky, incident, *Nickell*.

SEPTEMBER/OCTOBER 2006 (vol. 30, no. 5): Science and the public: Summing up thirty years of the Skeptical Inquirer, *Kurtz* / Predator panic: A closer look, *Radford* / The bloodless fish of Bouvet Island: DNA and evolution in action, *Carroll* / The neural substrates of moral, religious, and paranormal beliefs, *Spinella and Wain* / Science ain't an exact science: Public perception of science in the wake of the stem-cell fraud, *Koepsell* / Can Jim Berkland predict earthquakes?, *Hunter* / Name dropping, *Plait* / Ghost hunters, *Nickell*.

JULY/AUGUST 2006 (vol. 30, no. 4): Magnet therapy: A billion-dollar boondoggle, *Flamm* / The philosophy behind pseudoscience, *Bunge* / Why quantum mechanics is not so weird after all, *Quincey* / Science is for sale (and it's not only for the money), *Levi* / Why great thinkers sometimes fail to think critically, *Bensley* / Riddle of the crystal skulls, *Nickell*.

MAY/JUNE 2006 (vol. 30, no. 3): Special feature: From SETI to Astrobiology: Reassessment and Update—Four Views: SETI requires a skeptical reappraisal, *Schenkel* / The cosmic haystack is large, *Tarter* / Astrobiology is the new modern framework encompassing SETI . . . and so much else, *Morrison* / The new approach to SETI is from the bottom up, rather than the top down, *Darling* / Teaching pigs to sing, *Hall* / The *real* sword in the stone, *Garlaschelli* / Why scientists shouldn't be surprised by the popularity of intelligent design, *Lilienfeld* / "Curing" ADHD, *Bowd* / The PEAR proposition: Fact or fallacy?, *Jeffers* / The "new" idolatry, *Nickell*.

MARCH/APRIL 2006 (vol. 30, no. 2): Hoaxers, hackers, and policy makers, *Meinel* / Critical thinking: What is it good for? (In fact, what is it?), *Gabennesch* / The big bird, the big lie, God, and science, *Neimark* / The memory wars, parts 2 and 3, *Gardner* / Research review: Commentary on John P.A. Ioannidis's "Why most published research findings are false," *Hyman* / Argentina Mysteries, *Nickell*.

JANUARY/FEBRUARY 2006 (vol. 30, no. 1): The memory wars, Part 1, *Gardner* / Why did they bury Darwin in Westminster Abbey, *Weyant* / Paranormal beliefs: An analysis of college students, *Farha and Steward* / Ogopogo the Chameleon, *Radford* / The ethics of investigation, *Koepsell* / What "they" don't want you to know: An analysis of Kevin Trudeau's *Natural Cures* infomercial, *Barrett* / Conference report: The First Ibero-American Conference on Critical Thinking, *Radford* / Ogopogo: The Lake Okanagan monster, *Nickell*.

NOVEMBER/DECEMBER 2005 (vol. 29, no. 6): Special issue: Evolution and the ID Wars: Does irreducible complexity imply Intelligent Design? *Perakh* / Only a theory?, *Morrison* / The Intelligent Designer, *Rothchild* / Why scientists get so angry when dealing with ID proponents, *Rosenhouse* / The pope and I, *Krauss* / Endless forms most beautiful, *Carroll* / Obfuscating biological evolution, *Shneour* / Harris Poll explores beliefs about evolution, creationism, and Intelligent Design / Special report: Skeptics and TV news expose 'Magnetic water conditioner,' *Thomas* / Conference report: Developing perspectives on anomalous experiences, *Santomauro* / Legends of castles and keeps, *Nickell*.

SEPTEMBER/OCTOBER 2005 (vol. 29, no. 5): Special feature: Einstein and the World Year of Physics: We can still learn lessons from Einstein's watershed year, *Bennett* / The twin paradox, *Thomas* / Special Relativity after 100 years, *Geohegan* / Obesity: Epidemic or myth?, *Johnson* / The elixir of life, *Baarschers* / The god of Eth, *Law* / Palm readers, stargazers, and scientists, *Miller and Balcetis* / Beware of quacks at the WHO, *Renckens, Schoepen, and Betz* / Mystical Experiences, *Nickell* / Italy's 'miracle' relics, *Nickell*.

JULY/AUGUST 2005 (vol. 29, no. 4): Carl Sagan takes questions / The great turning away, *Druyan* / How do you solve a problem like a (Fritjof) Capra?, *Guttman* / Fakers and innocents, *Randi* / What should we do with skepticism?, *Borgo* / Special report: Voodoo science and voodoo politics in Florida, *Martinez* / The case of the 'psychic detectives,' *Nickell*.

MAY/JUNE 2005 (vol. 29, no. 3): Special feature: Testing "The girl with x-ray eyes": Testing Natasha, *Hyman*; Natasha Demkina: The girl with normal eyes, *Skolnick* / Psychic swindlers, *Davis* / Getting the monkey off Darwin's back, *Sullivan and Smith* / The psychologist, the philosopher, and the librarian, *Matthies* / Invited commentary: Brains, biology, science, and skepticism, *Tavris* / Special report: Johnny Carson Remembered, *Randi* / Special report: Claims of invalid "shroud" radiocarbon date cut from whole cloth, *Nickell* / Special report: Rebuttal to Joe Nickell, *Rogers* / Second sight: The phenomenon of eyeless vision, *Nickell*.

MARCH/APRIL 2005 (vol. 29, no. 2): One longsome argument, *Trumble* / Moonshine: Why the peppered moth remains an icon of evolution, *Young and Musgrave* / Hyperbole in media reports on asteroids and impacts, *Morrison* / Ringing false alarms: Skepticism and media scares, *Radford* / The glaring garret ghost, *Durm* / Scientists and the election, *Estling* / Comforting thoughts about death that have nothing to do with God, *Christina* / Intuition: The case of the unknown daughter, *Nickell*.

JANUARY/FEBRUARY 2005 (vol. 29, no. 1): Critical thinking about energy: The case for decentralized generation of electricity, *Casten* and *Downes* / Exploring controversies in the art and science of polygraph testing, *Ruscio* / A Nobel laureate confronts pseudoscience: Demagogues against scientific expertise & Brave thoughts are still not the truth, *Ginzburg* / Natural medicine: Will that be a pill or a needle?, *Baarschers* / Mystery painting: The shadow of the cross, *Nickell*.

NOVEMBER/DECEMBER 2004 (vol. 28, no. 6): Bacteria, ulcers, and ostracism? *H. Pylori* and the making of a myth, *Atwood* / Science and the public, *Dacey* / Why SETI is science and UFOlogy is not, *Moldwin* / Blind spots, brain maps, and backaches, *Hall* / Stupid dino tricks, *Martinez* / Explaining the plagues of Egypt, *Lee* / Special Report: Senate Intelligence Committee highlights need for skeptical inquiry, *Radford* / Rorschach icons, *Nickell*.

SEPTEMBER/OCTOBER 2004 (vol. 28, no. 5): Can the sciences help us to make wise ethical judgments?, *Kurtz* / The Columbia University 'miracle' study: Flawed and fraud, *Flamm* / 'Teach the controversy,' *Camp* / The Campeche, Mexico 'infrared UFO' video, *Sheaffer* / The anthropic principle and the Big Bang: Natural or supernatural?, *Perakh* / Alternative medicine and the biology departments of New York's community colleges, *Reiser* / Labyrinths: Mazes and myths, *Radford* / Ships of the dead, *Nickell*.

JULY/AUGUST 2004 (vol. 28, no. 4): Capital punishment and homicide, *Goertzel* / Defending science—within reason, *Haack* / Exposing Roger Patterson's 1967 Bigfoot film hoax, *Korff and Kocis* / Pranks, frauds, and hoaxes from around the world, *Carroll* / Seeing the world through rose-colored glasses, *Bowd and O'Sullivan* / Special report: PBS 'Secrets of the Dead' buries the truth about the Shroud of Turin, *Nickell* / Mythical Mexico, *Nickell*.

MAY/JUNE 2004 (vol. 28, no. 3): Darkness, tunnels and light, *Woerlee* / Nurturing suspicion, *Mole* / The Cold War's classified Skyhook program, *Gildenberg* / The strange odyssey of Brenda Dunne, *Stokes* / Bridging the chasm between two cultures, *McLaren* / I am Freud's brain, *Garry and Loftus* / 'Visions' behind *The Passion*, *Nickell* / Belgium skeptics commit mass suicide, *Bonneux* / Psychic sleuth without a clue, *Nickell*.

MARCH/APRIL 2004 (vol. 28, no. 2): Special Issue: Science and Religion 2004: Turmoil and Tensions. Why is religion natural? *Boyer* / Skeptical inquiry and religion, Kurtz / Exorcising all the ghosts, *Edis* / The roles of religion, spirituality, and genetics in paranormal beliefs, *Kennedy* / Development of beliefs in paranormal and supernatural phenomena, *Whittle* / Religious beliefs and their consequences, Layng / Secularization: Europe yes, United States no, *Zuckerman* / Not too 'bright,' *Mooney* / Point of honor: On science and religion, *Haack* / Benjamin Franklin's Enlightenment deism, *Isaacson* / In praise of Ray Hyman, *Alcock* / Hoaxes, myths, and manias (report on the Albuquerque conference), *Frazier* / The stigmata of Lilian Bernas, *Nickell*.

JANUARY/FEBRUARY 2004 (vol. 28., no. 1): Anti-vaccination fever, *Hoyt* / Skepticism of caricatures, *Gaynor* / Fallacies and frustrations, *Mole* / Judging authority, *Lipps* / A geologist's adventures with Bimini beachrock and Atlantis true believers, *Shinn* / The real method of scientific discovery, *Guttman* / Oxygen is good—even when it's not there, *Hall* / Contemporary challenges to William James's white crow, *Spitz* / UFOs over Buffalo!, *Nickell*.

NOVEMBER/DECEMBER 2003 (vol. 27, no. 6): Ann Druyan talks about science, religion, wonder, awe, and Carl Sagan, *Druyan* / Less about appearances: Art and science, *Nowlin* / King of the paranormal, *Mooney* / Sylvia Browne, *Farha* / Neither intelligent nor designed, *Martin* / Fellowship of the rings: UFO rings vs. fairy rings, *Nieves-Rivera* / The curse of Bodie, *Nickell*.

SEPTEMBER/OCTOBER 2003 (vol. 27, no. 5): The ongoing problem with the National Center for Complementary and Alternative Medicine, *Atwood* / What does education *really* do?, *Losh, Tavani, Njoroge, Wilke, and McAuley* / Nostradamus's clever 'clairvoyance', *Yafeh and Heath* / They see dead people—Or do they?, *Underdown* / Energy, homeopathy, and hypnosis in Santa Fe, *Seavey* / Faking UFO photos for the twenty-first century, *Callen* / Haunted plantation, *Nickell*.

JULY/AUGUST 2003 (vol. 27, no. 4): Special Report: Chasing Champ: Legend of the Lake Champlain monster, *Nickell* / The measure of a monster, *Radford* / The Rorschach inkblot test, fortune tellers, and cold reading, *Wood, Nezworski, Lilienfeld, and Garb* / Can minds leave bodies?, *Bensley* / Memory recovery techniques in psychotherapy, *Lynn, Loftus, Lilienfeld, and Lock.*

MAY/JUNE 2003 (vol. 27, no. 3): The Luck Factor, *Wiseman* / More hazards: Hypnosis, airplanes, and strongly held beliefs, *Pankratz* / 'Premenstrual dysphoric disorder' and 'premenstrual syndrome' myths, *Flora and Sellers* / A patently false patent myth—still!, *Sass* / Wired to the kitchen sink, *Hall* / Mediumship claim responses, Schwartz and Hyman / Dowsing mysterious sites, *Nickell*.

For a complete listing of our back issues, call 800-634-1610, or see http://www.csicop.org/si/back-issues.html.

one would do such a foolish thing. It would be much smarter to grant money to fewer researchers working for a longer period of time. This would allow them to read one another's papers, to discuss them at conferences, to improve experimental setups, etc. Such work takes time. Simply publishing a paper in a refereed journal normally takes months or years. TMA does not acknowledge that time is a resource in research.

Time is also a resource for another reason. In merely two months, not many important results will be produced within neuroscience, physiology, perception psychology, physics, or other areas with possible impact on parapsychology. But enormous progress has been achieved in the past, say, one hundred years in those fields and in many subfields with sizes comparable to parapsychology. Parapsychology's potential for benefitting from progress in other areas of inquiry is entirely lost on TMA. This weakness in TMA was acknowledged by Schouten: "I realize that this comparison is over-simplified, since in the one-hundred years of our research we profit from developments in other sciences which will not be possible to such an extent in a two-month period."

Maybe you will say I am kicking an open door here. Isn't it obvious that TMA is a metaphor? Would anyone take it literally? Sadly, some people do. Adrian Parker, for example, seems to be completely serious when using TMA as an excuse for not having a definition for psi for me. He really believes that the efforts of parapsychologists during more than one hundred years are equivalent to two months of psychological research.

Claiming that one's area of research is young, underfunded, and on the verge of a breakthrough is quite common in many fields, not only within parapsychology. But, so far, I have heard nothing resembling TMA from workers in other purportedly maltreated fields. My conjecture is that parapsychologists have a particularly strong need for TMA, since their results are so weak. But I would recommend adherents of parapsychological research not to use TMA. It is a bad and empty metaphor that reveals nothing.

References

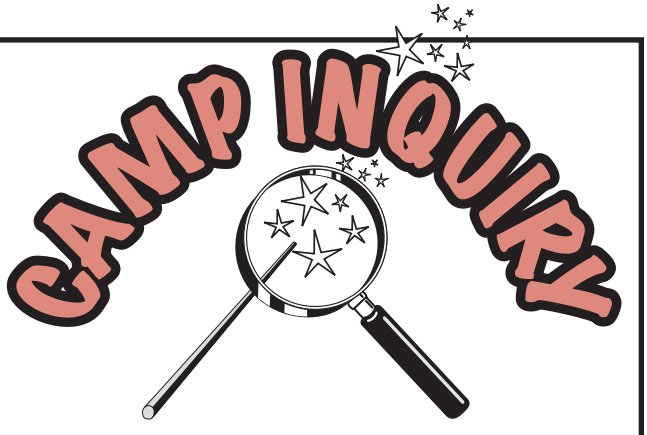
Honorton, Charles. 1993. Rhetoric over substance: the impoverished state of skepticism, *Journal of Parapsychology* 57: 191–214.

Parker, Adrian. 2006. Comment from Adrian Parker [in Swedish], *Parapsykologiska Notiser och Nyheter* [newsletter issued by Swedish SPR] 33, September 2006: 13.

Schouten, Sybo A. 1993. Are we making progress? In *Psi Research Methodology: A Re-examination*, edited by L. Coly and J. McMahon, New York: Parapsychology Foundation: 295–322.

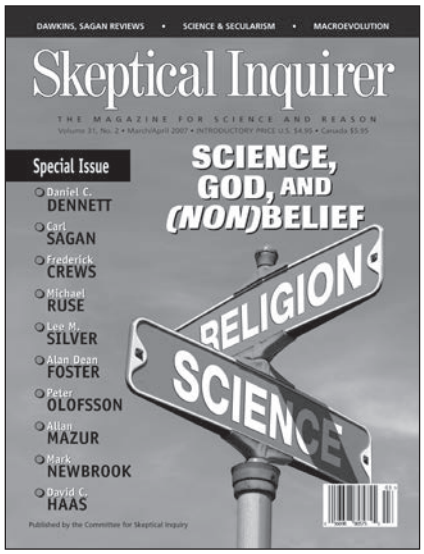
Utts, Jessica. 1995. Response to Ray Hyman's report of September 11, 1995, "Evaluation of program on anomalous mental phenomena,"

A week of adventure for Inquiring Minds ages 7–16 years.



July 15–21, 2007—Holland, NY

Join us this summer (or send your kids or grandkids) for Camp Inquiry 2007. From July 15th through the 21st, children in age groups 7–12 years and 13–16 years, along with Junior Counselors, 17 years and older, will embark on a week-long adventure of discovery and exploration. Twenty miles south of Buffalo, in Western New York, lies a breathtaking campground with over 400 acres of wilderness. Camp Inquiry takes place at the Empire State Lodge within the Camp Seven Hills property in Holland, New York. Along with staff and guest visitors, campers will experience the fun and exciting sides of inquiry-based learning. Our themes of science, critical thinking, skepticism, and secular humanism unfold through engaging activities for boys and girls of different ages. We will investigate the realms of the paranormal and supernatural and apply the skeptic's toolbox of reason and rationality. Campers will be introduced to the ethical concerns that we confront in our daily lives and participate in character-building workshops. Through magic and illusion, we will see how our minds can easily be fooled, and we will learn to recognize the nonsense thrown our way. The nature of hands-on, minds-on activity will provide campers with a powerful approach to making sense of the world around them—a way of thinking that will last a lifetime. Along with our unique focus, we will enjoy traditional camp activities, such as swimming, games, crafts, and campfires. We will participate in a field trip of fossil hunting, nature hikes, and stargazing. For more information, please visit us online at www.campinquiry.org or contact Amanda Chesworth at a.human@mindspring.com.



Science, God, and *(Non)*Belief: Readers Respond

A number of the articles in our special issue on "Science, God, and (Non)*Belief" (March/April 2007) provoked reader reaction. Here's a sampling (see also Joe Szimhart's Forum column, "Why I Burned a Bible," on page 58).—*EDITOR

At the Salk Institute forum that was reported in "A Free-for-All on Science and Religion" (March/April 2007), Charles L. Harper, senior vice president of the Templeton Foundation, accused Richard Dawkins of claiming that science has a monopoly on truth. Bearing in mind that science attempts to address questions regarding only nature, and that science makes plenty of errors but does its level best to correct them, I admit to some guilt here, too.

However, my mind is open on this, and I invite Harper—or anyone else—to cite examples where (1) science has come up with an untruth about a fact of nature, (2) some other method of inquiry has clearly demonstrated the error, and (3) science and its practitioners refused to acknowledge the error and correct it. Failing that, maybe science does have a monopoly. In fact, I can't even think of what other method of inquiry there might be.

Don Keith
Waterloo, Ontario
Canada

You invited reaction to your "Science and Religion" special issue. In a sentence, I feel strongly that the magazine should be seen to support the Michael Ruse line on religion rather than the Richard Dawkins one. I think it is important that the SKEPTICAL INQUIRER stick to mapping out and defending the high, solid ground of science and avoid the temptation to skirmish in nearby marshlands, even if they might seem to go with the territory.

The reasons are both tactical and logical. There are very many moderately religious people whose aims include being tolerant, doing the right thing, and understanding science. It would be counterproductive if they felt they were being attacked with weak arguments by people claiming to represent science and reason, especially if this also provided ammunition for their less moderate companions.

I have read *The God Delusion* and entirely agree with most of it but think Richard Dawkins loses the plot in a couple of areas. Yes, it is possible that there are huge numbers of universes, each with slightly different physical laws, so that ours is no surprise—but there is no evidence for this. Why the laws in our universe are as they are remains an open question, which should not be closed down prematurely. I always liked Isaac Asimov's short story "The Last Question," in which an advanced civilization in the distant future learns, in effect, how to transcend time. This could form the basis of a Cosmic Bootstrap God Hypothesis, with the universe created to order retrospectively by things that develop naturally within it. I'm not sure this is any more far-fetched as a creation story than the randomly self-generating universe idea that Dawkins seems to favor.

There are big, open, and rather wonderful questions that it is foolish to suggest are already answered. I enjoyed the issue, but please keep up the "healthy diversity" and make sure the magazine stays agnostic in areas where the evidence suggests we should be.

Paul Quincey
Teddington, Middlesex
U.K.

I picked up a copy of your magazine focused on Science, God and *(Non)*Belief, hoping to find informative, original ideas. But, instead of an impartial—albeit skeptical—inquiry, I found the same old diatribes, already much better written by other writers, many times over.

You certainly do not seem to be searching for any truth, because such searchers are first skeptical of themselves and their knowledge, and of the past and present mistakes and follies. (See, for example, the British journal, *Philosophy Now*.)

While I can understand your concern about the influence of religious dogma on society, or about the lack of scientific literacy, they both can be blamed on the squashing of intellectual curiosity in your country. It started about one hundred years ago, and it merrily continues, while the scientific community does nothing about it. With that in mind, you can hardly fight dogma with dogma, especially since yours cannot be inspiring even for your converts. They just accept it for what it is: dry, lifeless propaganda.

Wence Horak
Kelowna, B.C.
Canada

Dennett: Thank Who?

I agreed intellectually with everything in Daniel C. Dennett's discussion of how he "forgives" his religious friends who prayed for his recovery from heart surgery, but it left me feeling uncomfortable. So I read the piece to my wife and asked for her opinion. She learned to pray as a child and still prays in upsetting circumstances, though she has no religious faith at all and fully shares my hostility to religion. (We both love Dawkins's book, for example.) She explained that if she were praying for Dan (and she would, if she knew him), it would be a way of concentrating her mind on him, making him vividly present to herself, and focusing her hopes on his recovery. For her, intercessory efficacy has nothing to do with it. What Dan offered as his "translation"—"I've been thinking about you and wishing with all my heart that you come through this ok"—would be, for my wife, the entire content and meaning of her prayer. It seems to me that Dan gave "praying for your recovery" an unnecessarily literal interpretation. Perhaps this helps explain how Michael Ruse can think that Dennett is "pig ignorant" of the issues he has studied most intensively in recent years.

Eric Walther
New York City, New York

Ruse: Fighting the Fundamentalists

I just finished reading the excellent essay by Michael Ruse, "Fighting the Fundamentalists" (March/April 2007), and I want to

say, "Hear, hear!" This is the sort of practical common sense we need—and by "we," I mean both religionists and atheists.

While I enjoy reading the SKEPTICAL INQUIRER, I am often put off by the strident tone and what appears to be unreasoning dogmatism of some of the contributors. They sound just like the fundamentalists I am surrounded by here in the Bible Belt, only their scorn is directed at believers in God or ghosts instead of pagans and homosexuals. Some atheists seem to view the world in the same shades of black and white as some fundamentalists, as if one were a negative of the other. Open up and see the colors, people! There are good, intelligent people all over the spectrum.

My brother is a Catholic priest, and I am a nonbeliever. While we disagree on many things, there is an even greater array of issues on which we agree perfectly—arriving at the same opinion by different means. In those areas where we agree, let us work together instead of condemning and rejecting each other entirely for the opinion with which we disagree.

Sue Collins
Huntersville, North Carolina

After reading the article by Michael Ruse, I found myself as dismayed and frustrated as ever. Either Ruse is unaware of the history of the conflict between religion and science, or he labors under the delusion that Christians are being persecuted by the likes of Richard Dawkins, Daniel C. Dennett, and any other author who dares to identify religion as a collection of superstitious beliefs.

History does not support Ruse's naïve notion that atheists and religionists can work together when it comes to science and politics. It is religionists that make the provocative moves that divide us—and, if Bush's faith-based initiatives are any indication, they show no signs of ceasing these provocations any time soon.

The fact is, religion has *had* its time. Superstition has reigned for all of our known history. Look where that kind of thinking has led us. We are on the brink of global destruction, the likes of which no generation has seen before.

As long as personal beliefs remain personal, people should be free to believe as they wish. However, when religion is brought into the public arena, government, or public schools, or when policies are made based upon mythology, then all skeptics, atheists, and scientists are obligated to stand up and say, "That is just plain stupid."

Dawn Wilson
Seattle, Washington

Regarding Michael Ruse's article, "Fighting the Fundamentalists," I can't speak for how Ruse may have been treated by the likes of Dawkins or Dennett (I haven't read their books, but if they compare Ruse to a Nazi collaborator, I certainly don't agree he is anything comparable to that). But I do find Ruse's take on the culture war to be frustratingly narrow-minded. He seems so obsessed with a single issue (creationism) that he slights the fact that creationism is just the wedge, the trick pony the fundamentalists use to get their real agenda through. Yet Ruse seems to imagine it's the central argument, the centerpiece of the culture war. It's not. It's just smoke and mirrors.

The real issue consists of an entire system of moral and political values that fundamentalists want everyone indoctrinated in and the whole nation governed by. And underlying that is an entire epistemology built on logical fallacies and dangerously misleading principles of knowledge and certainty.

I know this, because I am actually in the trenches, where the religious—liberal and conservative—use the very arguments Dr. Ruse claims they don't (page 41) against us. I've debated issues more central and important to the culture warriors, like the resurrection of Jesus, at UCLA; the existence of God, before an audience of a thousand Muslims in Michigan; and the meaning of life, in a Berkeley church.

I can tell you, creationism is only a tiny piece of the real monster, and not the central piece. The religious—even many so-called liberals—believe atheists are fundamentally dangerous (even potential murderers, as I was accused of being in the Michigan debate). Polls show a majority in this country would never vote for an atheist, so it's not just the fundamentalists who are thinking this. Atheists (and thus atheism) are widely considered the cause of society's problems, and a majority believe the only way to solve our ills is to spread religion, most commonly, to convert everyone to Jesus (or Allah) and get everyone to agree that the religious are right about what Jesus (or Allah) wants. That's what this is really all about.

And yet, this culture war only exists because the religious embrace a horribly faulty epistemology that actually convinces them of these conclusions. The problem, therefore, is not creationism. The problem is religious epistemology. As long as we have that, we will always have fallacious and ridiculous beliefs like creationism, biblical literalism, false beliefs about atheism, and so on (and on the liberal side, as Lee Silver's article in the same issue of SI shows, anti-biotech mania).

Thus, we cannot accept Ruse's plan to quietly join forces with "other" religions. Because those religions are carriers and spreaders of the disease: bad epistemology and the false and fallacious beliefs resulting therefrom. We must be able to criticize them.

Richard Carrier
Author, *Sense and Goodness without God: A Defense of Metaphysical Naturalism* (2005)
richardcarrier.blogspot.com

If Michael Ruse thinks that his article is likely to achieve the unity of the anti-fundamentalist forces that he seeks, he's dreaming. His article displays the kind of combativeness that is sure to divide these forces further.

He simply does not understand the dynamics of the relationship between liberal Christians (and other religionists) and fundamentalists. Unless and until liberals like Jack Spong are prepared to repudiate dependence upon sacred scriptures (and so far, they're not), liberalism is a back door into fundamentalism, because fundamentalists always take more seriously the principles that liberals are apparently (but only apparently) willing to bargain away in order to make religion palatable to fringe members and doubters.

Ruse should read Kirsopp Lake's insightful 1925 book, *The Religion of Yesterday and Tomorrow,* in which this dynamic is explained in clear and prophetic terms. What Ruse does not understand is the function of institutionalists, like Rowan Williams (the present Archbishop of Canterbury), who always side with the fundamentalists when the institution is threatened, forcing the shifting of the institution from left to right.

And so, until liberal members of religions are prepared to abandon their dependence on the idea of sacred scripture and make it clear that there is a unbridgeable gulf separating them from fundamentalists, all members of religious groups are a danger, and atheists like Dawkins and Harris (and Dennett, though he comes in for undeserved condemnation in Ruse's piece) are right to point this out

Eric S. MacDonald

esmacdonald@eastlink.ca

Michael Ruse observes, "The creationists and the ID supporters simply love Dawkins and his ilk. They pray that they will say more and more. Every time the atheists open their mouths they win converts to the literalists cause." I disagree with "every time," but I do strongly advise caution when entering the fray.

Richard Dawkins does come on very strong, and I have no problem with that. However, in the doing, he needs to be airtight. On page twenty-three of *The God Delusion,* he cites an Ohio case in which the parents of a twelve-year-old boy successfully sued their school district for his right to wear a T-shirt that read, on the front, "INTOLERANT Jesus said . . . I am the way, the truth and the life John 14:6" On the back: "Homosexuality is a sin! Islam is a lie! Abortion is murder! Some issues are just black and white!"

Dawkins, arguing that religion gets too much legal leeway, said the decision was based on freedom of religion, not freedom of speech, which, he said, would have been a sure loss. In fact, the case *was* decided on freedom of speech (see United States District Court, Southern District of Ohio, Eastern Division, Case No. 2:04-cv-1149). That was an egregious error where accuracy is crucial. The literalists were given another round of ammunition.

Jay Nixon
Millville, Pennsylvania

Michael Ruse replies:

Let me thank all of those who took the time to respond to my opinion piece in the SKEPTICAL INQUIRER. *Someone once said that if they were offered a choice between the search for the truth and the truth itself, they would prefer the former. As a scholar and a teacher, I feel very much the same way, and I feel that the kinds of robust disagreements that we are having over such important issues mean that, while we may be modified monkeys in other respects, we humans are little lower than the angels. I won't say much about the contents of the letters, because they stand in their own right. But as a teacher, I must chide Richard Carrier. He will never get a passing mark in one of my classes until he starts doing his homework. He not only hasn't read Dennett and Dawkins, he hasn't read Ruse either! The entire theme of my recent book* The Evolution-Creation Struggle *(Harvard University Press, 2005) is that evolution is a litmus test for far deeper worries about the nature of society. Please don't criticize others until you have read what they have written. You might just find that they are ahead of you in making those very claims about which you claim to have unique insight.*

Oloffson's Coulter Hoax Satire

I recently subscribed to the SKEPTICAL INQUIRER and was excited to see an article about Ann Coulter ("The Coulter Hoax," by Peter Olofsson). Not even Bill O'Reilly or Rush Limbaugh makes me feel like jumping out of my skin the way Coulter does. My curiosity about her *Godless* book made me skim through it while at Barnes & Noble (I would *never* purchase it). Since I haven't heard her discuss evolution and ID on any of her TV appearances, I was surprised to see a chapter devoted to it in her book. How could a right-wing lawyer/author/pundit be an expert on scientific matters?

Olofsson's satire of Coulter was hilarious. He exposed her baseless argument by using one of her favorite techniques—sarcasm—except he did it with brilliance and humor. I enjoyed reading his article. Now, I better understand why I always vehemently disagree with her views on politics.

Robert Perovich
Parkland, Florida

Silver's Biotechnology Defense

Lee M. Silver, in his eagerness to promote biotechnology ("The Clash of Biotechnology and Post-Christian Spirituality," March/April 2007), offers the absurd contention that critics are "driven by a fear of violating a transcendent, divine authority." Let me suggest that corporate science historically hasn't posted a very good record of human benefit.

Thalidomide, fortunately banned in the U.S., may have been effective in reducing nausea in pregnant women, but those settled stomachs were bought at the price of babies born without limbs. DDT killed lots of malaria-carrying mosquitoes, but it also devastated bird populations. Chlorofluorcarbons, despite their value in transformers and other industrial uses, have scoured a huge hole in the protective ozone layer and, sad to say, are still used in dry-cleaning plants in Mexico and other developing countries. Research shows an association between phthalates—used to soften plastics (baby bottles, pacifiers, toys) and to stabilize perfumes in cosmetics—and the genital development in male children as well as premature breast development in young girls. Evidence now points toward the insecticide Imidacloprid as a likely cause of bee-colony-collapse disorder, which poses a very real threat to food production, possibly to the point of being a threat to human survival.

The biggest flaw in corporate science is the push for immediate profit, which mitigates against adequate testing over an extended time period. Instead, products are thrown onto the market, and into our environment, with little regard for potential ramifications. Genetically engineered/modified plants and animals are held up as the one and only answer to a growing human population, but facilitating population growth will not, in the long term, be advantageous to human survival.

Yet, there is little activity in the area of cheap, easy, effective methods of limiting human reproduction. Meanwhile, evidence mounts of the dangers posed by GM products such as grains that pollinate indiscriminately, thereby contaminating entire species and reducing the diversity that acts as an insurance policy when disaster strikes.

Silver asserts that "Post-Christian, Mother Nature spirituality is pernicious." When one looks at today's reality, it's clear that what is pernicious is the assumption that all scientific activity is by definition beneficial and should be accepted without question.

L.M. Arndt
San Rafael, California

Lee M. Silver gives an interesting view of some forces behind public resistance to biotechnology. However, his critique of organic agriculture lacks the convincing power that results from having one's own house in order before condemning the neighbors.

There are many differences between the primitive biotechnology of agrarian societies and the present day that are glossed over in Silver's essay. In this limited space, I may mention only one. In the present capitalist society, agriculture is first a business. The acknowledged purpose of business is to turn a profit; it is not to serve humanity or to expand scientific knowledge. It is the excesses spawned by this chain of events that have, if not given rise to, at least continued to sustain the popularity of organic agriculture.

Just as one should be skeptical of unsupported claims from organic proponents, so also should one be skeptical of claims rooted in the drive to maximize profits. Before con-

demning those who would rather see fewer pesticides on their plate or less fertilizer runoff in their lakes, consider how mainstream technology has contributed to (among many wonderful things) Love Canal, the ozone hole, and global warming. The public may be excused for fearing that modern biotechnology could well be another disaster in the making.

The long-term health and environmental- impact studies needed to assure us of the beneficial nature and lack of unintended consequences of many biotechnological advances will not likely be undertaken by those concerned with next quarter's profits or by a government that is fundamentally at their service. Public anxiety has valid components beyond the fuzzy thinking exposed by Silver.

Pantazis Mouroulis
Glendora, California

In "The Clash of Biotechnology and Post-Christian Spirituality," Lee Silver refers to the early twentieth-century invention of the Haber process for fixing nitrogen, which increased crop yields. The Haber process did not end hunger; it magnified hunger. Population grew to match the larger food supply. There are more chronically undernourished people today than there were people in 1900. The Green Revolution likewise increased crop yields and population without ending hunger.

Genetic engineering could reduce hunger by reducing the birthrate. The hormone in birth-control pills comes from a sweet potato. Engineers could move the genes responsible for the hormone from the sweet potato into staple foods: wheat, rice, maize, millet, white potato, cassava. But using GE solely to increase crop yields is not likely to end hunger.

Silver's main point is that, in post-Christian religiosity, GE is equated with sin, which God will punish. To support his assertion, he cites a survey of college undergraduates, but he fails to state the correlation between disapproval of GE and acceptance of post-Christian religiosity. I wonder if he asked his subjects, "Will God punish us for performing genetic engineering?" Silver hasn't proved his point.

Silver closes with a call for rational discussion of difficult trade-offs. But Silver's labeling his critics as driven by faith, delusional, indirectly responsible for children's deaths, dogmatic, ignorant, infected with a Mother Nature meme, and pernicious does not advance dialogue.

Alice Anderson
Las Cruces, New Mexico

Lee M. Silver replies:

When a person evinces blindness to stubborn facts or analyses that contradict his or her worldview, it is a sure sign that his or her worldview is based on faith rather than rationality. Arndt's letter displays multiple examples of blindness, most notably in the absurd belief that I or any other scientist could possibly think that "all scientific activity is by definition beneficial." A person with normal vision would have been able to read my conclusion that "the decision to accept or reject some biotech applications will involve difficult trade-offs among ethical values like human autonomy, preservation of cultural traditions, societal well-being, and environmental protection. But a rational understanding that trade-offs are, indeed, involved is essential for good policy making in a democratic society."

Another example of Arndt's problematic vision comes across in the belief that "corporate science historically hasn't posted a very good record of human benefit." A list of "corporate products" with negative effects is provided (with several dubious and disproved claims), but Arndt is blind to the numerous food-preservation techniques and biomedical products (antibiotics, vaccines, and numerous other medicines) sold from food stores and pharmacies to ordinary people in the developing countries of Asia and South and Central America (see my photographs at http://www.leemsilver.net). He is blind to the fact that life spans have risen continuously over the past half-century in nearly every part of the world, in both developed and developing countries, mostly due to "corporate science."

Mouroulis continues to hold blind faith in the belief that organic farming, which eschews genetically modified organisms, causes "less fertilizer runoff in lakes," even though I described how Canadian professors had already engineered a breed of pigs that produces 75 percent less phosphorous (a major lake pollutant) in its manure. Mouroulis also continues to hold faith in the belief that organic food contains "fewer pesticides" than nonorganic food, even though I explained how organic farmers are free to use highly toxic, chemical pesticides that are "natural." In fact, 99.99 percent of all chemical pesticides and carcinogens consumed within the human diet are produced naturally by organic plants. And, if you had a cup of organic coffee this morning, you ingested the carcinogenic pesticides acetaldehyde, benzaldehyde, benzene, formaldehyde, hydroquinone, 4-methylcatechol, styrene, toluene, and many others.

Mouroulis, like Arndt, conflates biotechnology with capitalism, which is condemned because it maximizes profits rather than serving humanity. In fact, as I wrote in my essay, biotechnology could be used in the service of humanitarian and environmental goals if only humanitarians and environmentalists could get over their blind opposition. Mouroulis also seems to believe that organic farming is somehow not capitalistic. In fact, most of the organic food produced in the U.S. comes from large profit-maximizing corporations. John Mackey, the CEO of the enormous Whole Foods Market chain, is an unabashed free-market capitalist.

Anderson, perversely, criticizes twentieth-century agricultural advances that allowed more food to be produced, more cheaply and on less land, because the result was that more children could escape death and survive to produce more children themselves. Unlike Mouroulis and Arndt, Anderson supports genetic engineering as long as it is used not to increase food productivity but to deprive people of individual human rights. Like Arndt, Anderson seems to think that wealthy, well-fed Western societies are problematic because they produce too many offspring. In fact, the opposite is true today. In all highly developed countries, where women are educated and independent, the birthrate has dropped precipitously, often below replacement levels.

Arndt, Mouroulis, and Anderson all hold romantic visions of an Eden-like preindustrial age when man was at peace with Mother Nature, and Mother Nature took care of man. But when we ate the apple of biotechnology, we sinned, and the apocalypse is now upon us. That sounds a lot like a religious story that has been making the rounds for two thousands years.

Haas's Prayer and Neurology

In the article "Prayer: A Neurological Inquiry" (David C. Haas, March/April 2007), the author demonstrates that there is no scientific way a supernatural being could read and know a person's thoughts. This is an exercise in futility. If a supernatural being exists, he (or she) certainly wouldn't need any scientifically demonstrable means to know people's thoughts. However, if such a being exists and hears our prayers, there is no evidence he does anything with that information. So the effect of believing in a god who hears prayers and does nothing is indistinguishable from not believing in a

god, as such a god would be irrelevant.

Al Schneider
Centerville, Ohio

A Thank You

As an uneducated plebian proletariat, I find it extremely difficult meeting skeptical and secular people.

Although working for minimum wage is my chosen path, this environment does not seem to lend itself to intellectual stimulation.

My thanks to SI magazine and CSI (I still like CSICOP better) for providing much solace and sincere rationalism. Reading about investigations and debunking of superstitious insanity is quite therapeutic.

In a world dominated by a cornucopia of pseudoscience and the paranormal, publications like SI magazine offer a refuge from fairy tales and a home for a tiny minority of a minority to share our love of nature and reality.

Thank you.

Barry Rowe
Melbourne, Florida

More on Name Change

Congratulations on the name change from Committee for the Scientific Investigation of Claims of the Paranormal to Committee for Skeptical Inquiry (January/February 2007)!

I believe that you are correct in your belief that this will clarify the scope of what you do: encouraging skeptical inquiry in all areas of life. I shall continue to endorse and promote the great service you do for so many people by encouraging critical thinking and living in reality.

Bob Steiner
(Proud to be a Fellow of the
Committee for Skeptical Inquiry)
bsteiner@earthlink.net

Naturalism Research Project

I read in the March/April 2007 issue that a Naturalism Research Project is being established ("Center for Inquiry Launches Naturalism Project" by John Shook). Your use of the word *naturalism* concerns me, for reasons that I have stated in several letters published during the last decade in the SKEPTICAL INQUIRER, *Free Inquiry, NCSE Reports,* and elsewhere. I would appreciate it if some supporter of "naturalism" would provide a good definition of the term and defend it against the kind of criticisms that I have made. The definition in the recent issue ("a worldview based on reason and science, without appeal to religious mythology or mysticism") is excessively vague.

John G. Fletcher
Livermore, California

John Shook replies:

John Fletcher is not wrong in pointing out that a variety of definitions of naturalism flourish. Any adequate explanation of the core concept of naturalism would require far more space than possible in this reply. Such an explanation should, as Fletcher might agree, avoid circularity by stressing the empirical method of science rather than the scientific theories accepted in any particular era. Brief statements of naturalism cannot help but refer to the best scientific knowledge of the day, but, assuredly, naturalism's defenders realize that tomorrow's science will be revolutionary, and they continually seek naturalism's most defensible form. Paul Kurtz's Philosophical Essays in Pragmatic Naturalism *(Prometheus Books, 1990) is a prominent example of this effort, and I recommend this book to the readers of SI. As science progresses, philosophical naturalism must strive to keep pace, so we are looking at an unending endeavor. Indeed, the purpose of the Naturalism Research Project is to encourage fresh thinking about elaborating and defending the naturalistic worldview in light of current scientific knowledge. From time to time, SI publishes, and will continue to publish, articles concerning the scientific method and naturalism that educate us about science's latest understanding of the world.*

The letters column is a forum for views on matters raised in previous issues. **Letters should be no more than 225 words.** Due to the volume of letters not all can be published. Address letters to Letters to the Editor, SKEPTICAL INQUIRER. Send by e-mail text (not as an attachment) to letters@csicop.org (include your name and address). Or mail to 944 Deer Drive NE, Albuquerque, NM 87122, or fax to 505-828-2080.

www.csicop.org

Become Informed!

Visit Our
Web SiteToday!

Skeptical Inquirer™

CSI
Committee for Skeptical Inquiry

COMMITTEE FOR SKEPTICAL INQUIRY

AT THE CENTER FOR INQUIRY/TRANSNATIONAL (ADJACENT TO THE UNIVERSITY AT BUFFALO)

AN INTERNATIONAL ORGANIZATION

Network of Affiliated Organizations

International

AUSTRALIA. Australian Skeptics Inc. New South Wales. Barry Williams (Executive Officer; Editor, *The Skeptic*). Tel: 61 (02) 9417 2071; fax: 61 (02) 9417 7930. contact@skeptics.com.au. PO Box 268 Roseville NSW 2069 Australia. www.skeptics.com.au. **Hunter Skeptics**. Hunter Region (Newcastle/Hunter Valley). Dr. David Brookman (President). Tel: 61 (02) 4957 8666; fax: 61 (02) 4952 6442. PO Box 166 Waratah NSW 2298 Australia. **Australian Skeptics (Vic) Inc.** Victoria. Christopher Short (President). Tel: 61 1 800 666 996. vic@skeptics.com.au. GPO Box 5166AA Melbourne VIC 3001 Australia. **Borderline Skeptics**. Victoria. Russell Kelly (President). Tel: 61 (02) 6072 3632. skeptics@wombatgully.com.au. PO Box 17 Mitta Mitta VIC 3701 Australia. **ACT Canberra Skeptics**. Canberra. Dr. Pete Griffith (President). Tel: 61 (02) 6231 5406 or 61 (02) 6296 4555. act@skeptics.com.au. PO Box 555 Civic Square ACT 2608 Australia. **Queensland Skeptics Assn. Inc.** Queensland. Bob Bruce (President). Tel: 61 (07) 3255 0499. qskeptic@uqnet.net.au. PO Box 6454 Fairfield Gardens QLD 4103 Australia. Qskeptics eGroup: to subscribe send a blank message to: qskeptics-subscribe@yahoogroups.com). **Gold Coast Skeptics**. Queensland. Lilian Derrick (Secretary). Tel: 61 (07) 5593 1882; fax: 61 (07) 5593 2776. lderrick@bigpond.net.au. PO Box 8348 GCMC Bundall QLD 9726 Australia. **South Australia Skeptics**. South Australia. Mr. Laurie Eddie (Secretary). Tel: 61 (08) 8272 5881. laurieeddie@adam.com.au. PO Box 377 Rundle Mall SA 5000 Australia. **Western Australia Skeptics**. Western Australia. Dr. John Happs (President). Tel: 61 (08) 9448 8458. happs@istnet.net.au. PO Box 431 Scarborough WA 6922 Australia. **Australian Skeptics in Tasmania**. Tasmania. Fred Thornett (Secretary). Tel: 61 (03) 6234 4731. fredthornett@iprimus.com.au. PO Box 582 North Hobart TAS 7002 Australia.

ARGENTINA. Alejandro J. Borgo. Revista *Pensar*. E-mail: info@pensar.org; Enrique Márquez, e-mail: skeptic@ciudad.com.ar; Juan de Gennaro, e-mail: argentinaskeptics@gmail.com.

BELGIUM. Comité Belge Pour L'Investigation Scientifique des Phénomènes Réputés Pananormaux Comité Para, Belgium. J. Dommanget, President of the Committee. E-mail: omer.nys@oma.be. Observatoire Royal Belgique 3, ave. Circulaire B-1180, Brussels, Belgium. www.comitepara.be. **Studiekring voor Kritische Evaluatie van Pseudowetenschap en Paranormale beweringen** (SKEPP) Belgium. Prof. Dr. W. Betz. Tel.: 32-2-477-43-11; e-mail: skepp@skepp.be Laarbeeklaan. 103 B-1090 Brussels, Belgium. www.skepp.be.

BRAZIL. Opçao Racional, Brazil. Luis Fernando Gutman. Tel.: 55-21-25392442 x4401; e-mail: opcaoracional@hotmail.com. Rua Professor Álvaro Rodrigues 255 apt 401 Botafogo. CEP: 22280-040, Rio de Janeiro, Brazil. www.opcaoracional.com.br.

BULGARIA. Bulgarian Skeptics, Bulgaria. Dr. Vladimir Daskalov. E-mail: egoshev@einet.bg. Krakra 22 BG-1504 Sofia, Bulgaria.

CANADA. British Columbia Skeptics, BC and Alberta. Lee Moller. Tel. 604-929-6299; e-mail:leemoller@shaw.ca. www.bcskeptics.info. 1188 Beaufort Road, N. Vancouver, BC V7G 1R7 Canada. **Skeptics Canada**, Eric McMillan, chair. Tel.: 647-341-7041; e-mail: chair@skeptics.ca. 873 Broadview Ave., Ste. 100A, Toronto, Ontario, M4K 2P9, Canada. www.skeptics.ca. **Ottawa Skeptics**, Ottawa, Ontario. Greg Singer. E-mail: skeptic@ottawa.com. PO Box 1237, Station B, Ottawa, Ontario K1P 5R3 Canada. www.admissions.carleton.ca/~addalby/cats/skeptic.html. **Sceptiques du Quebec**, Quebec. Alan Bonnier. Tel.: 514-990-8099. C.P. 202, Succ. Beaubien Montreal, Quebec H2G 3C9 Canada. www.sceptiques.qc.ca. **Skeptics Quinte**, Bill Broderick. 2262 Shannon Rd. R.R. 1, Shannonville, ON K0K 3A0 Canada; e-mail: broderic@kos.net.

CHINA. China Association for Science and Technology, China. Shen Zhenyu Research Center, P.O. Box 8113, Beijing China. **Hong Kong Skeptics**, Hong Kong. Kevin Ward, P.O. Box 1010, Shatin Central Post Office, Shatin NT China.

COSTA RICA. Iniciativa para la Promoción del Pensamiento Crítico (IPPEC) San Jose. Adolfo Solano; e-mail: didiersolano@hotmail.com. Postal address: Adolfo Solano (IPPEC-CR), A.P. 478-7050, Cartago, Costa Rica.

CZECH REPUBLIC. Sisyfos-Czech Skeptics Club. Czech Republic. Ms. Ing. Olga Kracikova, Secretary. Tel.: 420-2-24826691; e-mail: olgakracikova@email.cz. Hastalska 27 Praha 1 110 00 Czech Republic. www.fi.muni.cz/sisyfos/ (in Czech).

DENMARK. Skeptica: Association of Independent Danish Skeptics, Denmark. Willy Wegner. Tel.: 45-75-64-84-02; e-mail: skeptica@skeptica.dk. Vibevej 7 A DK 8700 Horsens, Denmark. www.skeptica.dk.

ECUADOR. Prociencia, Gabriel Trueba, Quito, Ecuador. Tel.: 2-894-320; e-mail: gabriel@mail.usfg.edu.ec.

ESTONIA Horisont. Indrek Rohtmets. EE 0102 Tallinn, Narva mnt. 5.

FINLAND. SKEPSIS, Finland. Jukka Hakkinen. PO Box 483, Helsinki 00101 Finland.

FRANCE. AFIS, AFIS (Association Française pour l'Information Scientifique) France. Jean Bricmont, President. 14 rue de l'Ecole Polytechnique F-75005 Paris, France. **Le Cercle Zététique**, France. Paul-Eric Blanrue. 12 rue; David Deitz. F-57000 Metz, France. **Laboratoire de Zététique** (laboratory). Professeur Henri Broch. Tel.: 33-0492076312; e-mail:broch@unice.fr. Université de Nice-Sophia Antipolis Faculté des Sciences F-06108 Nice Cedex 2 France. www.unice.fr/zetetique/.

GERMANY. Gesellschaft zur wissenschaftlichen Unterrsuchung von Parawissenschaften (GWUP) Germany. Amardeo Sarma, Chairman. Tel.: 49-6154-695023. E-mail: info@gwup.org. Arheilger Weg 11 D-64380 Rossdorf, Germany. www.gwup.org. **European Council of Skeptical Organizations** (ECSO) Europe. Dr. Martin Mahner. Tel.: 49-6154-695023; e-mail: info@ecso.org. Arheilger Weg 11 64380 Rossdorf, Germany. www.ecso.org/.

HUNGARY. Tényeket Tisztelk Társasága TTT Hungary. Prof. Gyula Bencze. Tel.: 36-1-392-2728; e-mail: gbencze@rmki.kfki.hu. c/o *Természet Világa*, PO Box 246 H-1444 Budapest 8 Hungary.

INDIA. Atheist Centre, Dr. Vijayam, Executive Director. Benz Circle, Vijayawada 520 010, Andhra Pradesh, India. Tel.: 91 866 472330; Fax: 91 866 473433. E-mail: atheist@vsnl.com. **Maharashtra Andhashraddha Nirmoolan Samiti** (MANS) states of Maharashtra & Goa. Dr. Narendra Dabholkar, Executive President. Tel.: 91-2162-32333; e-mail: ndabholkar@hotmail.com. 155, Sadashiv Peth Satara 415001 India. www.antisuperstition.com. **Indian Rationalist Association**, India. Sanal Edamaruku. E-mail: edamaruku@vsnl.com or IRA@rationalist international.net. 779, Pocket 5, Mayur Vihar 1, New Delhi 110 091 India. Dravidar Kazhagam, southern India. K. Veeramani, Secretary General. Tel.: 9144-5386555; e-mail: periyar@vsnl.com. Periyar Thidal, 50, E.F.K. Sampath Road Vepery, Chennai Tamil Nadu 600 007 India. www.Periyar.org. **Indian CSICOP**, India, B. Premanand, Convenor. Tel.: 091-0422-872423; e-mail: dayamini@md4.vsnl.net.in. 11/7 Chettipalayam Road Podanur Tamilnadu 641 023 India.

ITALY. Comitato Italiano per il Controllo delle Affermazioni sul Paranormale (CICAP) Italy. Massimo Polidoro, Executive Director. Tel.: 39-049-686870; e-mail: polidoro@cicap.org. P.O. Box 1117 35100 Padova, Italy. www.cicap.org.

IRELAND. The Irish Skeptics Society c/o Paul O'Donoghue, 11 Woodleigh Elm, Highfield Rd., Rathgar, Dublin 6. Ireland; www.irishskeptics.net E-mail:contact@irishskeptics.net.

JAPAN. Japan Anti-Pseudoscience Activities Network (JAPAN) Japan. Ryutarou Minakami, chairperson. c/o Rakkousha, Inc., Tsuruoka Bld. 2F, 2-19-6, Kamezawa, Sumida-ki,Tokyo. skeptic@e-mail.ne.jp. **Japan Skeptics**, Japan. Dr. Jun Jugaku. E-mail: jugakujn@cc.nao.ac.jp. Japan Skeptics, Business Center for Academic Societies, Japan 5-16-9 Honkomagome, Bunkyo-ku Tokyo 113-8622 Japan.

KAZAKHSTAN. Kazakhstan Commission for the Investigation of the Anomalous Phenomena (KCIAP) Kazakhstan. Dr. Sergey Efimov, Scientific Secretary. Astrophysical Institute, Kamenskoye Plato, Alma-Ata, 050020, Kazakhstan. E-mail: efim@aphi.kz.

KOREA. Korea PseudoScience Awareness (KOPSA) Korea. Dr. Gun-Il Kang, Director. Tel.: 82-2-393-2734; e-mail: KOPSA@chollian.net. 187-11 Bukahyun-dong, Sudaemun-ku, Seoul 120-190 Korea www.kopsa.or.kr.

MALTA. Society for Investigating the Credibility of Extraordinary Claims (SICEC) Malta. Vanni Pule, Chairman. Tel.: 356-381994; e-mail: pulevan@vol.net.mt. Address: c/o 67, Trig il-Pruna, Attard, BZN04, Malta.

MEXICO. Mexican Association for Skeptical Research (SOMIE) Mexico. Mario Mendez-Acosta, Apartado Postal 19-546 D.F. 03900 Mexico.

NETHERLANDS. Stichting Skepsis, Netherlands. Jan Willem Nienhuys, Secretary. e-mail: jnienhuy@win.tue.nl. Dommelseweg 1A, 5581 VA Waalre, Netherlands.

NEW ZEALAND. New Zealand Skeptics, New Zealand, Vicki Hyde, Chair. Tel.: 64-3-384-5136; e-mail: Vicki@spis.co.nz. PO Box 29-492, Christchurch, New Zealand. www.skeptics.org.nz.

NIGERIA. Nigerian Skeptics Society, Nigeria. Leo Igwe, Convenor. E-mail: dpc@skannet.com.ng. PO Box 25269, Mapo Ibadan Oyo State, Nigeria.

NORWAY. SKEPSIS. Norway St. Olavsgt. 27 N-0166 Oslo, Norway.

PERU. Comite de Investigaciones de lo Paranormal lo Seudocientifico y lo Irracional CIPSI-PERU, Lima, Peru. Manuel Abraham Paz-y-Mino. Tel.: +51-1-99215741; e-mail: cipsiperu@yahoo.com. El Corregidor 318 Rímac, Lima 25 Peru. www.geocities.com/cipsiperu.

POLAND. Polish Skeptics, Adam Pietrasiewicz. E-mail: redaktor@iname.com. www.biuletynsceptyczny.z.pl.

PORTUGAL. Associaçao Cépticos de Portugal (CEPO) Portugal. Ludwig Krippahl. E-mail: cepo@interacesso.pt. Apartado 334 2676-901 Odivelas, Portugal. http://cepo.interacesso.pt.

RUSSIA. Dr. Valerii A. Kuvakin. Tel.: 95-718-2178; e-mail: V.KUVAKIN@MTU-NET.RU. Vorob'evy Gory, Moscow State University, Phil. Dept. Moscow 119899 Russia. http://log.philos.msu.ru/rhs/index/htm.

SINGAPORE. Singapore Skeptics. Contact: Ronald Ng. E-mail: ronaldng@iname.com.www.skeptic.iwarp.com.

SLOVAK REPUBLIC (SACT). Slovak Republic. Igor Kapisinsky Pavla Horova, 10 Bratislava 841 07 Slovak Republic.

SOUTH AFRICA. Marian Laserson. P.O. Box 46212, Orange Grove 2119 South Africa. **SOCRATES. South Africa. Cape Skeptics**, Cape Town. Dr. Leon Retief. Tel.: 27-21-9131434. E-mail: leonr@iafrica.com. 5N Agapanthus Avenue, Welgedacht Bellville 7530 South Africa.

SPAIN. Círculo Escéptico. Fernando L. Frías, chairman. Apartado de Correos 3078, 48080 Bilbao, Spain. E-mail: informacion@circuloesceptico.org. Web site: www.circuloesceptico.org. **ARP-Sociedad para el Avance del Pensamiento Crítico** ARP-SAPC Spain. Félix Ares de Blas. Tel.: 34-933-010220; E-mail: arp@arp-sapc.org. Apartado de Correos, 310 E-08860 Castelldefels, Spain. www.arp-sapc.org.

SRI LANKA. Sri Lanka Rationalist Assoc. Contact: Dushyantha Samaiasinghe, Promethean Home, 192/D Dawatagahawatta Rd., Kesbewa, Piliyandala, Sri Lanka.

SWEDEN. Swedish Skeptics, Sweden. Jesper Jerkert, chairperson. Vetenskap och Folkbildning c/o Sigbladh Administration Box 10022 S-181 10 Lidingö Sweden. E-mail: info@vof.se; Web site: www.vof.se/.

TAIWAN. Taiwan Skeptics, Taiwan. Michael Turton, Director. AFL Dept., Chaoyang University. 168 G-IFeng E. Rd., Wufeng, Taichung 413.

UNITED KINGDOM. *The Skeptic* Magazine, United Kingdom. Mike Hutchinson. E-mail: subs@skeptic.org.uk. P.O. Box 475 Manchester M60 2TH United Kingdom.

VENEZUELA. Asociación Racional Escéptica de Venezuela (AREV), Sami Rozenbaum, president. Address: Rozenbaum, Apdo. 50314, Caracas 1050-A, Venezuela. Web site: www.geocities.com/escepticos venezuela. E-mail: escepticos@cantv.net.

United States

ALABAMA. Alabama Skeptics, Alabama. Emory Kimbrough. Tel.: 205-759-2624. 3550 Watermelon Road, Apt. 28A, Northport, AL 35476 US.

ARIZONA. Tucson Skeptics Inc. Tucson, AZ. James McGaha. E-mail: JMCGAHA@PimaCC.Pima.EDU. 5100 N. Sabino Foothills Dr., Tucson, AZ 85715 US. **Phoenix Skeptics**, Phoenix, AZ. Michael Stackpole, P.O. Box 60333, Phoenix, AZ 85082 US.

CALIFORNIA. Sacramento Organization for Rational Thinking (SORT) Sacramento, CA. Ray Spangen-burg, co-founder. Tel.: 916-978-0321; e-mail: kitray@quiknet.com. PO Box 2215, Carmichael, CA 95609-2215 US. www.quiknet.com/~kitray/index1.html. **Bay Area Skeptics** (BAS) San Francisco—Bay Area. Tully McCarroll, Chair. Tel.: 415 927-1548; e-mail: tullyann@pacbell.net. PO Box 2443 Castro Valley, CA 94546-0443 US. www.BASkeptics.org. **Independent Investigations Group (IIG),** Center for Inquiry–*West*, 4773 Hollywood Blvd, Los Angeles, CA 90027 Tel.; 323-666-9797 ext. 159; Web site:www.iigwest.com. **Sacramento Skeptics Society**, Sacramento. Terry Sandbek, President. 4300 Auburn Blvd. Suite 206, Sacramento CA 95841. Tel.: 916 489-1774. E-mail: terry@sandbek.com. **San Diego Association for Rational Inquiry** (SDARI) President: Richard Urich. Tel.: 858-292-5635. Program general information 619-421-5844. Web site:www.sdari.org. Snail mail address: PO Box 623, La Jolla, CA 92038-0623.

COLORADO. Rocky Mountain Skeptics (RMS; aka Colorado Skeptics) Béla Scheiber, President. Tel.: 303-444-7537; e-mail: rms@peakpeak.com. PO Box 4482, Boulder, CO 80306 US. Web site: http://bcn.boulder.co.us/community/rms.

CONNECTICUT. New England Skeptical Society (NESS) New England. Steven Novella M.D., President. Tel.: 203-281-6277; e-mail: board@theness.com. 64 Cobblestone Dr., Hamden, CT 06518 US. www.theness.com.

D.C./MARYLAND. National Capital Area Skeptics NCAS, Maryland, D.C., Virginia. D.W. "Chip" Denman. Tel.: 301-587-3827. e-mail: ncas@ncas.org. PO Box 8428, Silver Spring, MD 20907-8428 US. http://www.ncas.org.

FLORIDA. Tampa Bay Skeptics (TBS) Tampa Bay, Florida. Gary Posner, Executive Director. Tel.: 813-849-7571; e-mail: tbs@cfiflorida.org; 5201 W. Kennedy Blvd., Suite 124, Tampa, FL 33609 US. www.tampabayskeptics.org. **The James Randi Educational Foundation.** James Randi, Director. Tel: (954)467-1112; e-mail jref@randi.org. 201 S.E. 12th St. (E. Davie Blvd.), Fort Lauderdale, FL 33316-1815. Web site: www.randi.org.

GEORGIA. Georgia Skeptics (GS) Georgia. Rebecca Long, President. Tel.: 770-493-6857; e-mail: arlong@hcrc.org. 2277 Winding Woods Dr., Tucker, GA 30084 US.

IOWA. Central Iowa Skeptics (CIS) Central Iowa, Rob Beeston. Tel.: 515-285-0622; e-mail: ciskeptics@hotmail.com. 5602 SW 2nd St. Des Moines, IA 50315 US. www.skepticweb.com.

ILLINOIS. Rational Examination Association of Lincoln Land (REALL) Illinois. Bob Ladendorf, Chairman. Tel.: 217-546-3475; e-mail: chairman@reall.org. PO Box 20302, Springfield, IL 62708 US. www.reall.org.

KENTUCKY. Kentucky Assn. of Science Educators and Skeptics (KASES) Kentucky. 880 Albany Road, Lexington, KY 40502. Contact Fred Bach at e-mail: fredwbach@yahoo.com; Web site www.kases.org; or (859) 276-3343.

LOUISIANA. Baton Rouge Proponents of Rational Inquiry and Scientific Methods (BR-PRISM) Louisiana. Marge Schroth. Tel.: 225-766-4747. 425 Carriage Way, Baton Rouge, LA 70808 US.

MICHIGAN. Great Lakes Skeptics (GLS) SE Michigan. Lorna J. Simmons, Contact person. Tel.: 734-525-5731; e-mail: Skeptic31@aol.com. 31710 Cowan Road, Apt. 103, Westland, MI 48185-2366 US. **Tri-Cities Skeptics**, Michigan. Gary Barker. Tel.: 517-799-4502; e-mail: barkerg@svol.org. 3596 Butternut St., Saginaw, MI 48604 US.

MINNESOTA. St. Kloud Extraordinary Claim Psychic Teaching Investigating Community (SKEPTIC) St. Cloud, Minnesota. Jerry Mertens. Tel.: 320-255-2138; e-mail: gmertens@stcloudstate.edu. Jerry Mertens, Psychology Department, 720 4th Ave. S, St. Cloud State University, St. Cloud, MN 56301 US.

MISSOURI. Kansas City Committee for Skeptical Inquiry, Missouri. Verle Muhrer, United Labor Bldg., 6301 Rockhill Road, Suite 412 Kansas City, MO 64131 US.

NEVADA. Skeptics of Las Vegas, (SOLV) PO Box 531323, Henderson, NV 89053-1323. E-mail: rbanderson@skepticslv.org. Web site: www.skepticslv.org./.

NEW MEXICO. New Mexicans for Science and Reason (NMSR) New Mexico. David E. Thomas, President. Tel.: 505-869-9250; e-mail: nmsrdave@swcp.com. PO Box 1017, Peralta, NM 87042 US. www.nmsr.org.

NEW YORK. New York Area Skeptics (NYASk) metropolitan NY area. Jeff Corey, President. 18 Woodland Street, Huntington, NY 11743, Tel: (631) 427-7262 e-mail: jcorey@liu.edu, Web site: www.nyask.com. **Inquiring Skeptics of Upper New York** (ISUNY) Upper New York. Michael Sofka, 8 Providence St., Albany, NY 12203 US. **Central New York Skeptics** (CNY Skeptics) Syracuse. Lisa Goodlin, President. Tel: (315) 446-3068; e-mail: info@cnyskeptics.org, Web site: cnyskeptics.org 201 Milnor Ave., Syracuse, NY 13224 US.

NORTH CAROLINA. Carolina Skeptics North Carolina. Eric Carlson, President. Tel.: 336-758-4994; e-mail: ecarlson@wfu.edu. Physics Department, Wake Forest University, Winston-Salem, NC 27109 US. www.carolinaskeptics.org.

OHIO. Central Ohioans for Rational Inquiry (CORI) Central Ohio. Charlie Hazlett, President. Tel.: 614-878-2742; e-mail: charlie@hazlett.net. PO Box 282069, Columbus OH 43228 US. **South Shore Skeptics** (SSS) Cleveland and counties. Jim Kutz. Tel.: 440 942-5543; e-mail: jimkutz@earthlink.net. PO Box 5083, Cleveland, OH 44101 US. www.southshoreskeptics.org/. **Association for Rational Thought** (ART) Cincinnati. Roy Auerbach, president. Tel: 513-731-2774, e-mail: raa@cinci.rr.com. PO Box 12896, Cincinnati, OH 45212 US. www.cincinnati skeptics.org.

OREGON. Oregonians for Rationality (O4R) Oregon. Jeanine DeNoma, president. Tel.: (541) 745-5026; e-mail: wilkinsa@peak.org; 39105 Military Rd., Monmouth, OR 97361 US. Web site: www.o4r.com.

PENNSYLVANIA. Philadelphia Association for Critical Thinking (PhACT), much of Pennsylvania. Eric Krieg, President. Tel.: 215-885-2089; e-mail: eric@phact.org. By mail C/O Ray Haupt 639 W. Ellet St., Philadelphia PA 19119.

TENNESSEE. Rationalists of East Tennessee, East Tennessee. Carl Ledenbecker. Tel.: 865-982-8687; e-mail: Aletall@aol.com. 2123 Stonybrook Rd., Louisville, TN 37777 US.

TEXAS. North Texas Skeptics NTS Dallas/Ft Worth area, John Blanton, Secretary. Tel.: 972-306-3187; e-mail: skeptic@ntskeptics.org. PO Box 111794, Carrollton, TX 75011-1794 US. www.ntskeptics.org.

VIRGINIA. Science & Reason, Hampton Rds., Virginia. Lawrence Weinstein, Old Dominion Univ.-Physics Dept., Norfolk, VA 23529 US.

WASHINGTON. Society for Sensible Explanations, Western Washington. Tad Cook, Secretary. E-mail: K7RA@arrl.net. PO Box 45792, Seattle, WA 98145-0792 US. http://seattleskeptics.org.

PUERTO RICO. Sociedad De Escépticos de Puerto Rico, Luis R. Ramos, President. 2505 Parque Terra Linda, Trujillo Alto, Puerto Rico 00976. Tel: 787-396-2395; e-mail: Lramos@escepticospr.com; Web site www.escepticor.com.

The organizations listed above have aims similar to those of CSI but are independent and autonomous. Representatives of these organizations cannot speak on behalf of CSI. Please send updates to Barry Karr, P.O. Box 703 Amherst NY 14226-0703.

SCIENTIFIC AND TECHNICAL CONSULTANTS

Gary Bauslaugh, editor, *Humanist Perspectives*, Victoria, B.C., Canada
Richard E. Berendzen, astronomer, Washington, D.C.
Martin Bridgstock, Senior Lecturer, School of Science, Griffith University, Brisbane, Australia
Richard Busch, magician/mentalist, Pittsburgh, Penn.
Shawn Carlson, Society for Amateur Scientists, East Greenwich, RI
Roger B. Culver, professor of astronomy, Colorado State Univ.
Felix Ares de Blas, professor of computer science, University of Basque, San Sebastian, Spain
Michael R. Dennett, writer, investigator, Federal Way, Washington
Sid Deutsch, consultant, Sarasota, Fla.
J. Dommanget, astronomer, Royale Observatory, Brussels, Belgium
Nahum J. Duker, assistant professor of pathology, Temple University
Barbara Eisenstadt, psychologist, educator, clinician, East Greenbush, N.Y.
William Evans, professor of communication, Center for Creative Media
Bryan Farha, professor of behavioral studies in education, Oklahoma City Univ.
John F. Fischer, forensic analyst, Orlando, Fla.
Eileen Gambrill, professor of social welfare, University of California at Berkeley
Luis Alfonso Gámez, science journalist, Bilbao, Spain
Sylvio Garattini, director, Mario Negri Pharmacology Institute, Milan, Italy
Laurie Godfrey, anthropologist, University of Massachusetts
Gerald Goldin, mathematician, Rutgers University, New Jersey
Donald Goldsmith, astronomer; president, Interstellar Media
Alan Hale, astronomer, Southwest Institute for Space Research, Alamogordo, New Mexico
Clyde F. Herreid, professor of biology, SUNY, Buffalo
Terence M. Hines, professor of psychology, Pace University, Pleasantville, N.Y.
Michael Hutchinson, author; SKEPTICAL INQUIRER representative, Europe
Philip A. Ianna, assoc. professor of astronomy, Univ. of Virginia
William Jarvis, professor of health promotion and public health, Loma Linda University, School of Public Health
I. W. Kelly, professor of psychology, University of Saskatchewan
Richard H. Lange, M.D., Mohawk Valley Physician Health Plan, Schenectady, N.Y.
Gerald A. Larue, professor of biblical history and archaeology, University of So. California
William M. London, California State University, Los Angeles
Rebecca Long, nuclear engineer, president of Georgia Council Against Health Fraud, Atlanta, Ga.
Thomas R. McDonough, lecturer in engineering, Caltech, and SETI Coordinator of the Planetary Society
James E. McGaha, Major, USAF; pilot
Chris Mooney, journalist, author, Washington correspondent, *SEED* Magazine
Joel A. Moskowitz, director of medical psychiatry, Calabasas Mental Health Services, Los Angeles
Jan Willem Nienhuys, mathematician, Univ. of Eindhoven, the Netherlands
Matthew C. Nisbet, assistant professor, School of Communication, American University
John W. Patterson, professor of materials science and engineering, Iowa State University
Massimo Pigliucci, professor in Ecology & Evolution at SUNY-Stony Brook, NY
James R. Pomerantz, professor of psychology, Rice University
Gary P. Posner, M.D., Tampa, Fla.
Daisie Radner, professor of philosophy, SUNY, Buffalo
Robert H. Romer, professor of physics, Amherst College
Karl Sabbagh, journalist, Richmond, Surrey, England
Robert J. Samp, assistant professor of education and medicine, University of Wisconsin-Madison
Steven D. Schafersman, asst. professor of geology, Miami Univ., Ohio
Chris Scott, statistician, London, England
Stuart D. Scott, Jr., associate professor of anthropology, SUNY, Buffalo
Erwin M. Segal, professor of psychology, SUNY, Buffalo
Carla Selby, anthropologist/archaeologist
Steven N. Shore, professor and chair, Dept. of Physics and Astronomy, Indiana Univ. South Bend
Waclaw Szybalski, professor, McArdle Laboratory, University of Wisconsin-Madison
Sarah G. Thomason, professor of linguistics, University of Pittsburgh
Tim Trachet, journalist and science writer, honorary chairman of SKEPP, Belgium
David Willey, physics instructor, University of Pittsburgh
*Member, CSICOP Executive Council

CENTERS FOR INQUIRY

www.centerforinquiry.net

TRANSNATIONAL
P.O. Box 703, Amherst, NY 14226
Tel.: (716) 636-1425

WASHINGTON, D.C.
621 Pennsylvania Ave. SE, Washington, D.C. 20003,
Tel.: (202) 546-2331

WEST
4773 Hollywood Blvd., Los Angeles,
CA 90027 Tel.: (323) 666-9797

METRO NEW YORK
One Rockefeller Plaza, #2700,
New York, NY 10020
Tel.: (212) 265-2877

POLAND
Lokal Biurowy No. 8, 8 Sapiezynska St., 00-215 Warsaw, Poland

FLORIDA
5201 West Kennedy Blvd., Ste. 124, Tampa, FL 33609, Tel.: (813) 849-7571

EGYPT
44 Gol Gamal St., Agouza, Giza, Egypt

FRANCE
Prof. Henri Broch,Universite of Nice, Faculté des Sciences,Parc Valrose, 06108, Nice cedex 2. France
www.unice.fr/zetetics/

NEPAL
Humanist Association of Nepal, P.O. Box 5284, Kathmandu, Nepal Tel.: +977 125 7610

ARGENTINA
Av. Santa Fe 1145, 2do piso, C1059ABF, Buenos Aires, Tel.: 54-11-5273-6383

PERU
D. Casanova 430, Lima 14, Peru

INDIA
Innaiah Narisetti
A-60, Journalist Colony, Jubilee Hills, Hyderabad-500 033 India, Tel.: 91-040-23544067
http://innaiahn.tripod.com

EUROPE
Dr. Martin Mahner. Arheilger Weg 11, D-64380 Rossdorf, GermanyTel.: +49 6154 695023

MOSCOW
Professor Valerií A. Kuvakin
119899 Russia, Moscow, Vorobevy Gory,
Moscow State University, Philosophy Dept.

NIGERIA
P.O. Box 25269, Mapo, Ibadan, Oyo State, Nigeria
Tel.: +234-2-2313699